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A Manual of Arithmetic for Teachers

Based on the Wheeler's Graded Arithmetic

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E. E. OBERHOLTZER,
Superintendent of City Schools
Tulsa, Okla.

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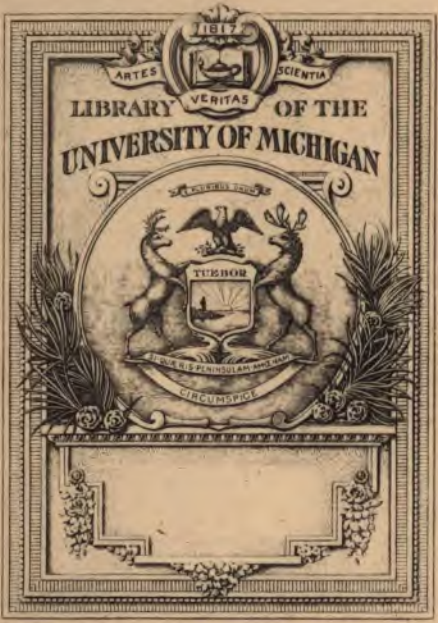

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A Manual of Arithmetic for Teachers

Giving Practical Suggestions for Teaching of Arithmetic in the
Elementary Grades and Junior High School. Based
on the Wheeler's Graded Arithmetic

Edison Ellsworth

By
. E. OBERHOLTZER
Superintendent of City Schools
Tulsa, Okla,

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PREFACE.

It is the purpose of this manual to make plain to teachers in the elementary schools and the junior high school the purpose of teaching arithmetic, and to outline in a simple way the fundamental ideas and methods of presenting the subject in the various grades. It is strictly a teacher's book and not designed for the use of the child. It can be used most successfully as a supplement to the arithmetic, giving valuable suggestions for an enlargement of the subject. It has been generally felt that arithmetic stands aloof from other studies, but the attempt is made here to show the very intimate and important relation that it bears to the other studies; likewise to present some practical applications not fully treated in the text.

Teachers should use this manual much in the same way as the good and experienced teacher uses the text-book or the course of study; namely, as a supplementary device which offers suggestions applicable to the teaching of the subject, for after all the teacher's cheif purpose is to teach the student the subject rather than to teach the subject. With these suggestions it is hoped that teachers will read fully this text preceding that portion which gives the solution to the various problems, in order that the point of view as well as the objective in teaching arithmetic be correctly understood.

Grateful acknowledgement is hereby made to the teachers and supervisors of the Tulsa City Schools who have given many helpful suggestions and assisted in the solution of problems contained in this volume.

E. E. OBERHOLTZER.

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CHAPTER I.

The Origin and Growth of Arithmetic.

The word, arithmetic, is derived from the Greek word, *arithmos*—number, and designates the study of number. The primitive conceptions of number were very crude. The origin of the conception is uncertain. Careful investigation has failed to yield knowledge sufficiently accurate to justify discussion of this subject in a work like the present; moreover the origin of the conception of number is probably beyond the proper limits of inquiry.

Our ideas of number are the result of our past experiences, and those of our ancestors; hence, the history of arithmetic as a subject dealing with number must necessarily deal with widely varying opinions of its importance in its relation to life. In fact it is only comparatively recent that arithmetic has been held of much importance.

Toward the close of the 18th century the modern treatment of elementary arithmetic began to show itself. In 1776 very little improvement upon the old plan of pretending to teach all of counting, then all of addition, then all of subtraction, had been made. About 1780 Christian Trapp published a pedagogical treatment of number in which he worked out a scheme for teaching young children how to add and subtract by the use of objects; likewise he devised a systematic use of blocks to illustrate the relation of tens to units; thus, introducing simple work in multiplication and division. The appearance of this work may be reckoned as the beginning of modern teaching of elementary arithmetic.

During the first quarter of the 19th century Pestalozzi stimulated interest in arithmetic by introducing methods emphasizing perceptions; that is, the further use of objects in developing the number sense. Pestalozzi stressed oral work as a means of training the mind. Number work was begun when entering the first grade and continued through the course.

Following Pesttalozzi came Grube who has been given credit as influencing most modern methods of teaching arithmetic. The Grube method introduced certain leading ideas of the Herbarthian pedagogy, and presented artificial objects such as cubes, blocks, and splints as number devices. Dr. Rein further modified the Grube method by starting the children with familiar things taken from the environment of the home, or nature, or the stories they have heard, believing that number work in its beginning should spring from familiar groups of objects already known to the child. By this method the doctrine of correlation is fully employed and the next great step in method is made an easy one, that of bringing up the larger units of thought by drills, comparisons, and applications.

If we turn our attention to the history of arithmetic in the United States, we observe that for many years it has held a commanding place in the public schools. This is true because of two controlling convictions; first, that arithmetic is of great practical value to the common man, and second, that it is a means of efficient mental training. As a matter of fact the last twenty-five years has seen a reversal of these ideas. The subject of arithmetic, as treated in the public schools, is being purged of a great many technical and impractical phases which have proved of little value in direct service to the man of common affairs; likewise we have a weakening of the doctrine of mental discipline, or the use of arithmetic as a subject for mental gymnastics. We find also a curtailment of the doubtful topics, because the course of study in the common schools has become weighted with a variety of subjects invaluable in the training for practical life and citizenship: American history, nature study, physical training, art and English. Subjects of this kind are gradually crowding out the three "R's" among which arithmetic held a prominent place.

In recent times arithmetic has found its place in the common school curriculum through the development of the number idea by means of measurement, which implies activity; the adjustment of a means to an end. For example the number *one* is not a fixed thing, but a standard unit with which to measure some larger as yet undefined whole.

The symbols of arithmetic as well as the processes have been derived from various methods which the following pages will explain.

It is well that the reader should understand the characters used in these different methods.

*EXPRESSION OF NUMBER.

"*The Gesture Method.* No doubt the earliest method of representing numbers was the finger method, the fingers being used to designate the objects whose number was desired. This method is frequently used among the masses to this day for communicating small numbers and is used by brokers on the stock exchange. Since the fingers are always accessible; since they are "so similar in form and in function;" and since the system of expressing number most in use (the Arabic) is decimal, the method of expressing number by the fingers probably antedated all other methods.

However, it is a fact that some tribes do not know numbers beyond the number 2; this tends to support the theory that possibly some other method existed prior to the finger method. With the fingers alone, or with any concrete objects, it would be difficult to represent 16/17 of an apple directly.

The Chinese Method. It is relatively easy to count up to ten; but primitive people have found difficulty in counting higher numbers. In South Africa it takes two people to count higher numbers, one to count up to ten and another to count and keep record of these tens. But the Chinese overcame this great difficulty by the use of the *swan-pan.* This instrument consists of a rectangular board surrounded by a frame in which are fastened ten rods made of bamboo, on which are strung small ivory balls. All numbers up to ten are recorded on one rod; the tens are recorded on a second rod, and so on. It is at once seen that numbers almost without limit can be represented by the *swan-pan.*

The Word Method. This method followed the gesture method as soon as the language of a people was sufficiently developed to have words for numbers, as, *one, two, five, twelve,* etc.

The Roman Method. All are somewhat familiar with the Roman method and how it employs the letters of the alphabet to represent numbers. Why the Romans used some of the letters to the exclusion of the others is not so well known. It is thought that the Romans did not invent this system, but that the Etruscans did. However, the Romans practiced the system.

This system employs eight characters in the expression of numbers: the seven letters I, V, X, L, C, D, and M, and the bar (—). I stands for one, V for five, X for ten, L for fifty, C for one hundred, D for five hundred, M for one thousand; and the bar (—), when placed over any letter or group of letters, multiplies the value of the number thus expressed by one thousand; thus, $\overline{V}$ stands for five thousand, $\overline{L}$ for fifty thousand, $\overline{XC}$ for ninety thousand.

---

*Kelso, O. L. Arithmetic. Macmillan, pp. 4-8.

The positional idea is present in the Roman System to a very limited extent; as, VI, IV, IX, and LX. For the most part the value attached to a symbol depends upon its shape and not upon its place or position.

The following principles govern the Roman System:

I. Repeating a letter repeats its value; II stands for two; XX for twenty; CC for two hundred.

II. When a letter is placed *after* one of greater value, the number represented is the sum of the numbers expressed by the letters separately; VI stands for five and one, or six; LX for sixty; CI for one hundred one; DV for five hundred five.

III. When a letter is placed before one of greater value, the number expressed is the difference of the numbers represented by the letters singly; IV stands for four; XL for forty; XC for ninety. VX is not allowable, for the value represented has a symbol of its own. The same might be said of DM and LC. IIX stands for eight.

IV. When a letter stands between two of greater values, its value is combined with that of the one following it, or its value is taken from the combined values of the two greater; XIV stands for fourteen; CXL for one hundred forty; and LIV for fifty-four.

V. A letter is placed before one of its own order, or before one of the next higher order only. Hence, IM was not used for nine hundred ninety-nine, for I and M do not stand in consecutive, or the same orders. IL was not used for forty-nine nor XD for four hundred ninety.

V, L, and D do not bear repetition. VV, LL and DD represent numbers which have symbols of their own.

At the present day the Roman System of expressing numbers is not used for computation, but is used for marking the number of a chapter, a page of a book, the time on the face of a clock, or physicians' prescriptions.

The Arabic Method. This is the method that is in common use. It is superior to any other method in existence, since it is the clearest and simplest. To appreciate its superiority one has but to attempt a problem in division by some other method.

It is called the Arabic Method, or System, because the Arabs introduced it into Europe, although the system is probably of Indian origin.

The Arabic System uses ten characters to express numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0. The first and ninth inclusive are called digits, and the tenth is called zero, or cipher, or naught.

The word "digit" is derived from *digitus*, a finger, the fingers being the first natural counters. The first nine numbers are represented by nine digits, and the tenth is represented by the digit "1" and zero "0"; thus, 10. It is not known just when the symbol "0" was invented. It represents nothing when by itself.

The distinguishing feature of the Arabic System is its method of grouping numbers into tens and representing the *number* of groups by a digit and the *character* of the group by the *place* of the digit. The great value of the system comes of this feature.

This positional idea gives rise to two values for any one of the nine digits, a *simple* value and a *local* value. The *simple* or *intrinsic* value of a figure is its value when alone. It is sometimes called the *absolute* value of a figure. The local or place value of a figure is its value when taken in connection with another to express a number. Thus, in 245, the value expressed by "2" is two hundred; by "4", forty; and by "5", five. The simple value of "4" is four, the local value of it is forty.

The principle of local value, or the positional idea, is carried out to perfection because of the invention of "0." This idea is found in other systems to a limited degree; but since other systems have no "0", the idea cannot be so perfectly carried out in them. Should any of the series in a number be wanting, as in six hundred seven, where tens do not occur, the place is filled by "0" in the Arabic System, which throws the digit expressing hundreds in its proper place. Thus, 607."

Considered from a historical standpoint the development as well as the teaching of arithmetic has been very wasteful of time and energy, and consequently a great deal of subject matter has crept in which has become relatively useless. Modern methods must necessarily embody the controlling ideas, which organize for us the study of arithmetic. Briefly stated, they are, as follows:

(1) In the primary class arithmetic must spring from the activity of the children as they become interested in measuring and constructing with units of common use.
(2) The simplification of number concepts is greatly enhanced by the use of illustrative materials, devices which are taken from the familiar objects of the child's life.
(3) The main units as we advance in the study of arithmetic should be quantitative wholes, requiring to be estimated and measured, thus giving motivation to the work.
(4) In the intermediate and grammar class many topics from geography, manual arts, history and science should be worked out quantitatively so as to give number interpretation to these facts. This will also enable closer correlation of the other subjects with arithmetic.
(5) The trend of recent thought in the discussion of arithmetic is toward greater thoroughness in the mastery of the elementary processes, developing not only command of the processes, but also the best mental habits.

After all, arithmetic becomes of use to man only so far as it trains him in counting or calculating. This is best explained by the development of the different systems of symbols for calculation, which have been described on the preceding pages and explained in various methods. Of these we shall deal only in actual calculation with the symbols of the Roman and Arabic systems.

Modern arithmetic is a subject which deals generally with two conceptions and these conceptions are the organizing principles which determine the method in the subject. The following quotation illustrates very well this viewpoint.

*"These two conceptions—(a) the origin of quantitative ideas in the process of valuation (measuring), and (b) the dependence of valuation upon the adjustment of means to end (i. e. ultimately upon activity) are the beginning of all conceptions of quantity and number, and the sound basis of all dealing with them."

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*McLellan and Dewey, "Psychology of Numbers," Educational Publishing Company, p. 41.

CHAPTER II.

The Aim and Content of Arithmetic.

AIM.

The first aim of arithmetic is the mastery of the world on the quantitative side through number ideas or concepts. It involves the training of the ability to estimate quantitatively in numerical terms the material facts of the objective world, all its varied objects and forces as seen in the physical world in its relation to man. To gain this mastery the child must have a varied number experience in measuring the things of the objective world. He must measure, analyze, compare and express the result in number language. He must become familiar with the standards of measuring units, which are in common use among the people; for example, those of every day life, such as the yard stick, the hour, the year, the ton, the dozen, the score, the square foot, gallon, bushel; such instruments as the thermometer, scales for weighing; such examples of value or magnitude as the acre, the horse power, the dollar. These measurements call for a training and experience which are related to the great variety of number expression and number operation. Thus it is that one who is trained in the subject of arithmetic must possess the power of mathematical language and know how to interpret it. Yet it has taken thousands of years of time and experience to work out an efficient and satisfactory number language, a set of number symbols and number operations together with their applications.

In the process of measuring and comparing objects, there is involved the operations of addition, subtraction, multiplication and didivision, which when extended lead to the more complicated operations of factoring, fractions, decimals, percentage, and the whole series of processes or operations which are included in the general field of arithmetic. Together with the measurements and operations, the children must learn a large number of positive number facts in order to make progress in the mastery of the processes themselves.

Number in itself is an abstract mental process, by which we put number ideas into things. This process becomes necessary in order that the student take on the attitude of thinking number. In this sense we may say that number conception begins with the measurement of things, as we relate them one to another, or as we interpret them in terms of a standard unit. This process develops toward abstract number and number operation, yet in the application of the number idea or concept we must constantly return to physical things, as objects to measure or estimate.

On one side we may say that the purpose of number work is to put the child in the possession of the mastery of calculation; on the other side, it is to give him a better mastery of the world through greater insight into the varied physical objects and activities. Arithmetic in the common schools should give a child this point of view; the ability to see and estimate things with a mathematical eye. Number facts and processes are necessary to educate the eye and brain in the facts of which the school should make the student the master. The thing we aim at, therefore, is the completely practical and accurate mastery of our material surroundings or environment from the point of view of number interpretation. We do not study arithmetic primarily for a mastery of the mathematical processes or the discipline which may result, but rather for the use and the facility which these processes add to the power of the individual in number interpretation.

Arithmetic is a subject which deals with number, and number concepts and relation. It is well that the teacher should understand in the beginning that the subject matter is definite and the fundamental principles of the subject are true throughout. A few fundamental principles to be observed in the teaching of arithmetic are:

I. Two main practical purposes in the study of arithmetic:

1. To acquire accuracy and rapidity in both mental and written performance of the four fundamental operations with numbers, integral and fractional. This is the mechanical phase of the subject.

2. To develop power in the solution of problems. This is the intelligent phase of the subject.

II. Function of intelligence and mechanism.

1. Processes should be learned intelligently, then drilled until they become mechanical, automatic.

2. Problems should be grasped and method of solution determined intelligently; the actual work of solution should be mechanical.

III. General principles of method.

1. The acquisition of mechanical facility and accuracy. First, let the process be made plain; second, require frequent repetition, with concentrated attention of a limited number of facts, until they can be given automatically.

2. Development of reasoning power—ability to solve problems. This depends in general upon the natural growth of mind which comes with age and experience.

Helpful practice comes through the intelligent, independent solution of problems always within, but not too much within the pupil's capacity to understand.

The ability to read a problem is fundamental to its solution.

There are three clarifying questions which a pupil should form the habit of asking and answering, not mechanically, but thoughtfully, before beginning the actual work of solving a problem:

First question: What is given—what do I know that immediately concerns this problem?

Second question: What am I required to find?

Third question: How shall I find it?

Failure to distinguish sharply between the place of intelligence and mechanism in arithmetic is chiefly responsible for that frequent muddled condition of the pupil's mind and work. Pupils stop to think when they should answer; answer, when they should stop to think.

To acquire mechanical facility, hurry.

To acquire reasoning power, deliberate.

3. "Objects" and pencil and paper should be used as an aid to thought, not as a substitute for it.

Objects should be used in making intelligible mechanical processes; but when those processes are once understood, they should be drilled, without objects, until they become automatic. The tendency is to use objects far too little.

We class drawings and diagrams, as well as measures, splints, etc., under the term "objects."

Pencil and paper are to be used in doing what cannot be readily done mentally. These instruments are used too much for making figures, too little for making diagrams and drawings. Many mechanical operations are done slowly with the pencil which should be done quickly "in the head." No intelligence resides in the pencil; it should never be set at work until the mind has thought out clearly just what the pencil is to do, and for what purpose.

In the teaching of arithmetic certain important facts should be understood by teachers. Some of these truths to be faithfully considered in the elementary work are:

1. The mastery of the four fundamental processes in the manipulation of integers and fractions belongs to the early years of school life.

2. The mental discipline that arithmetic gives develops the individual's power to reason and trains to habits of careful observation, rapidity and accuracy in execution and exactness of statement.

Elementary arithmetic should concern itself with questions that arise in every day situations, and thus help in a practical way to train for life's need.

4. The due proportion of abstract work and the solving of concrete problems should be considered in each grade, as both are necessary to the pupil's mathematical progress.

5. The oral work in both phases of arithmetic should not only precede the written work in the beginning of the study but should go hand in hand with it throughout the course, to give ear and tongue training and to help pupils to think without tools in the fingers.

6. **Drill should have an important place in early mathematics,** to fix facts and give skill in dealing with processes rapidly and easily. It is essential that drill have the elements of variety and interests associated with it.

7. Concrete work means the observation, visualization and imaging of objects should not be used past the point of need at any stage, but should be introduced in the grades whenever a situation demands such aid that materials can best offer.

8. All phases of arithmetic should be made as interesting as possible and presented to children as important.

9. Habits of independent thinking, of making clear analysis, of executing thoughtfully, of proving work, and of constantly increasing concentration should grow stronger from grade to grade.

CONTENT.

Arithmetic is only one of the branches of mathematics, and mathematics is in a degree merely the logic of science which has its many ramifications in the world of thought. The general scope of arithmetic is determined not by arithmetic alone but by the world of affairs. Arithmetic in the public schools should constantly undergo a process of adaptation until it provides the material and the processes which train the child to articulate most perfectly in the society of which he is a part.

It may sometimes seem that arithmetic is wholly a distinct branch of knowledge, and in its purely scientific and systematic form is purely abstract, yet it is not mathematics as a distinct and separate science with which we have most to do in the elementary school, but rather it is arithmetic which treats the mathematical phase of every subject in the course. The teacher should fully appreciate the general utility of arithmetic as well as its broad and comprehensive value. If this phase of the subject is developed, the child will understand the importance it bears to the affairs of life, and will take an added interest in the mastery of the subject. To develop this interest among the students, it is easy to direct their attention to the progress which is dependent upon knowledge of calculation from the study of arithmetic in particular, and mathematics in general.

Every great work of man has in some measure been the result of mathematical interpretation. Every feat of engineering, of sculpture, or architecture, or adornment, or construction, has been dependent largely upon the contributions of the mathematical engineer and expert. The subject of science itself must look to the mathematician to interpret the workings and results of the scientific law, when applied to a particular case.

While we do not introduce in the elementary schools arithmetic with its enlarged scope, yet we must teach the essence of the subject which holds that a number fact or a mathematical truth is universal in its value and application. The general doctrine of the utility, that is, the serviceableness of arithmetic as an interpreter of our surroundings from the number point of view, rescues it from all narrow and sordid considerations. It is not utility in the bread and butter sense, but in the broader sense of service. This should distinguish it in common with all other school studies.

The content of arithmetic as it is outlined in the work of the public school is constantly changing, as the aim or point of view of teaching it changes. In recent years the tendency has been to narrow the content to the basis of minimum essentials and to use only those phases of the subject which have direct and practical application. This is the result of a movement to enlarge the course of study and to bring in the great wealth of material which is offered in other subjects of the course. Consequently a great many eliminations of subject matter are [illegible] effected, such elimination being those phases of the subjects which are no longer useful in [illegible] custom.

Topics which have become obsolete, or which are for the use of the technical specialist, or which are seldom used by the [illegible] citizen may be omitted from the [illegible] these subjects are the following: apothecaries [illegible] proportion, [illegible] true discount, [illegible] except those of [illegible] (simple [illegible]), [illegible] ing [illegible], [illegible] weight, [illegible] of this kind which [illegible] practical value [illegible] and point of view [illegible] ing [illegible] of [illegible] sary [illegible] che[illegible] the [illegible] geography, history, chemistry [illegible] ual [illegible] from the [illegible] and business.

If the teacher desires to awaken an interest in the practical uses of arithmetic and at the same time to intensify the interest in the other subjects, it is a good method to derive problems from the other subjects to supplement the regular arithmetic text. For example, if the process is addition, let the problems relate to the field of geography, including raw production, commerce, manufacturing; or from the field of civics, problems of taxation, municipal accounting or phases of this nature. This material is available, but in most cases necessitates an extra effort on the part of the teacher, in organizing and making such material accessible. From the geography table take the areas of the states, or of the continents, or of the ocean and compile addition problems. From the city auditor or the county clerk obtain the tax estimates and the budgets which explain the expenditures and operation expenses of these municipalities. Now this means the student will get a point of view from which to estimate more accurately and more simply. This knowledge will help to clarify a great deal of the complex machinery and operations of which the ordinary citizen is not informed.

Quoting from Dr. J. F. Bobbitt's, "What the Schools Teach and Might Teach," we find the following paragraph summarizes very well the determining factors for the aim and content of arithmetic, to-wit:

"The content of mathematics courses is to be determined by the human needs. One of the fundamental needs of the age upon which we are now entering is accurate quantitative thinking in the fields of one's vocation, in the supervision of our many co-operative governmental labors, in our economic thinking with reference to taxation, expenditures, insurance, public utilities, civic improvements, pensions, corporations, and the multitude of other civic and vocational matters."

CHAPTER III

The Fundamental Processes.

The fundamental processes have long been considered the foundation stones of arithmetical operations. To know how to add, subtract, multiply and divide, and to possess a complete mastery over these processes is an achievement which every good student in arithmetic must strive for, but in order to stimulate and inspire the student, the teacher must be the master likewise of these processes. It is easy to write down a column of figures and to teach the beginner how to combine these figures into one sum, but it is a much more difficult process to instruct the beginner in the proper method of thinking number combinations and in fixing upon the beginner the proper habits of calculation. The same suggestions which we make here with reference to addition are equally applicable to subtraction, multiplication, and division. It is hoped that the following chapters treating the fundamental processes will give to the teacher complete mastery of these processes, and enable her to teach these processes with greater confidence and better results.

The teacher should study carefully the suggestions for presenting the operations and especially the principles underlying them, for if these principles are mastered, they will serve as a safeguard against wrong methods, wrong ideas and wrong habits and will enhance the appreciation of the fact that these principles are universal in their application.

Let me illustrate one error in the operation which violates the principles of multiplication, and yet this error is found in most pupils' work, and I am sorry to say is the result generally of poor teaching.

 6 inches
x6 inches
—
36 square inches.

This problem is one in finding the area and violates principle No. 1. Principle No. 2 likewise violates the law of universal application, for if the first were mathematically true, then it should apply with equal truth to the following:

 6 circles
x6 circles
—
36 square circles,

which is, of course, an absurdity. To observe the principles of multiplication and of mathematical measurement, the student should be taught the unit of measurement, one square inch multiplied by six gives the product, thirty-six square inches, which is the result desired.

This illustrates in a simple way a disregard for the principles of process which may lead to errors that destroy the fundamental process itself. It is thought that a careful study of the discussion of these fundamental processes will aid the teacher materially.

*NUMERATION AND NOTATION

"The method of expressing numbers systematically by *words* is called *numeration;* and the method of expressing numbers systematically by symbols is called *notation.*

---

*Kelso, O. L., Arithmetic, Macmillan Co., pp. 11-32.

The common system of notation is further simplified by pointing off the figures into periods of three figures each. the first period is called units' period; the second to the left is called thousands' period; the next, millions' period; the next, billions' period.

Each period has units, tens, and hundreds of its kind. This is the custom of the French. The English plan is to group the figures into periods of six figures each. At least four periods of three figures each should be well learned, since that many are used in practice. Occasionally the fourth period is used, but not the fifth except in very rare instances. No one can appreciate a number expressed in the *third* period.

PRINCIPLES OF THE ARABIC SYSTEM

1. Each digit, in itself, always represents the same number of units. This has reference to the *simple value* of a figure.
2. The order of these units depends upon the place the digit occupies with reference to units' place. This has reference to the *local value* of a figure.
3. The sum of the values thus represented is the value of the whole expression.
4. Zero (0) has no value by itself, but is used to fill vacant places.

Numbers which are written in accordance with the Arabic Scale are called Simple Numbers. The idea of simple numbers may be so extended as to include all numbers written in a uniform scale, where the number of the characters used is the same as the number of units in the radix.

Numbers written in a scale which is not uniform are called Compound Numbers. 3 lb. 2 oz. 17 pwt. 13 gr. is a compound number, for the radix is 60, and uniform. but the number of characters is not 60.

UNITY

The idea of *unity* underlies all number work, whether in arithmetic or in algebra.

Every number is derived from some fixed unit either by multiplication or division; thus, the number *five* comes from taking something five times, and the number *one-fifth* comes from dividing something into five parts.

One's age is definitely expressed to another if some unit is agreed upon and number applied to it. Thus, if the year is the unit, and the number 19 is applied to it, the expression 19 years of age represents something definite. If the unit *yard* has the number 300 applied to it, the result 300 yards is a definite thing. But the same result is obtained if the unit *ten yards* has the number 30 applied to it. The same result is obtained by applying the number 3 to the unit *one-hundred yards*, or by applying the number 600 to the unit *one-half yard*, or by applying the number 1200 to the unit *one-quarter yard*.

Units are of two kinds: *primary* units and *derived* units. In pure numbers the unit "1" is the primary unit; and the units 1-2, 1-3, 2-5, 3, 8 and 13 are derived units. In turn, derived units are of two kinds: *multiple* units and *fractional* units. In denominate numbers the yard, the pound, the gallon, the dollar, are regarded as primary units; while the foot, the rod, the ounce, the quart, the barrel, the dime, the eagle, are derived units. Derived units are sometimes called *secondary* units.

If a unit is thought of as entire, complete or as undivided, it is called an *integral* unit. The primary unit is always integral, while some derived units are integral and some are not. Hence, an *integral number* is one composed of integral units.

FUNDAMENTAL OPERATIONS

There are four and only four fundamental operations in number work: Addition, Subtraction, Multiplication, and Division.

ADDITION

Addition has its origin in counting. Addition is nothing more than abbreviated counting when the number to be added, or the addend, is 1. In passing from one number already formed to the next consecutive number the process is very simple. In passing from *four* to *five* the act is that of counting. In fact, the *beginner* passes from *four* to *nine* by counting the ones.

Addition is the process of combining two or more numbers into one number called their sum. The operation of addition is always possible, with such limitations only as are found in the following principles:

I. Only like numbers can be added. Thus, 4 apples and 3 apples are 7 apples. 4 apples cannot be added to 3 benches, and get a result that is alone apples or benches.

II. The sum is like the addends.

III. The sum is the same whatever the order of the addends. Thus, 4 pt. plus 3 pt. plus 2 pt. equals 9 pt.; also, 4 pt. plus 2 pt. plus 3 pt., or 3 pt. plus 2 pt. plus 4 pt., or 2 pt. plus 4 pt. plus 3 pt. equals 9 pt. This is usually called the Commutative Law of Addition.

IV. The numbers to be added may be grouped in any manner without affecting the sum. Thus, (4 lb. plus 5 lb. plus 2 lb.) plus 3 lb. equals (3 lb. plus 5 lb. plus 2 lb.) plus 4 lb. equals (2 lb. plus 3 lb. plus 4 lb.) plus 5 lb.

The sum is 14 lb. whatever the manner of grouping. This is called the Associative Law of Addition.

In preparing numbers for addition it is customary to write them so that units of the same kind shall stand in columns; but this must not be overdone, for it is often convenient to add numbers just as they are found.

Since numbers increase from right to left in place value, begin at the right to add, so that if the sum of units of any order contains enough units to make one or more of a higher order, these higher units may be combined with the units of a like order.

As a check upon accuracy it is advisable to perform the addition a second time, not in the same, but in the reverse order.

Addition, after a fair amount of practice, seems to require little mental effort. Any suggestion, therefore, as to shortening the process seems to be out of order. However, a few hints are here offered to save mental fatigue.

Exercise. Say four, six, eleven, fourteen, twenty-four; do not say four and two are six, six and five are eleven, eleven and three are fourteen, and so on.

$$\begin{array}{r} 5{,}342 \\ 6{,}278 \\ 4{,}733 \\ 9{,}385 \\ 1{,}422 \\ 2{,}684 \\ \hline 29{,}844 \end{array}$$

Take advantage of the commutative and associative laws, and change the order of the numbers in a column or group sets of numbers whose sums is ten. Thus, in the first column say four, fourteen, twenty-four. In the second, say ten, twenty, thirty, thirty-four. In the third, say three, thirteen, twenty-three, twenty-eight.

In adding 494 and 296 it is easy to think four away from 494 and add it to 296; now say 490 and 300 equals 790. This simplifies the process and so diminishes the likelihood of error.

SUBTRACTION

Every mathematical operation has its inverse operation. The inverse operation undoes what the operation itself does.

Subtraction is the inverse of addition, and should be studied immediately after addition, for the relation between a process and its inverse is best seen when they are studied in close connection.

Numerical subtractions cannot always be made. Regard must be had to the numbers concerned. The subtrahend must never be greater than the minuend. Hence, the process of subtraction is a limited one.

Subtraction is the process of finding a number which, when added to the smaller of two numbers, will produce the larger. This operation can be performed by the simple act of counting. Independent of addition, subtraction is defined as the operation of finding the difference between two numbers. Subtraction is concerned with two ideas:

I. That of the difference between two numbers or quantities.

II. That of diminishing a given number or quantity. For example: A has a grammar class of 28 pupils, and B has a reading class of 21 pupils. The problem is to find the difference in the number of pupils in the two classes.

Again: A has a grammar class of 58 pupils, which is too large. A wishes to keep 32 of these pupils and with the remainder form another class. How many will the other class contain?

In the first example the minuend and the subtrahend are two entirely distinct numbers or quantities, and the remainder is a part of the minuend. In the second example the minuend, subtrahend, and the remainder are found at first in one number or quantity. This second idea leads to another definition. Subtraction is the process of diminishing a number.

PRINCIPLES OF SUBTRACTION.

I. Subtraction is concerned with like numbers only.

II. The remainder is like the subtrahend or minuend.

III. The minuend is equal to the sum of the subtrahend and the remainder.

IV. If the minuend and subtrahend are equally increased or diminished, the remainder is not affected. The difference in age between a parent and his child remains the same through life. If one box contains 75 pebbles and another contains 40 pebbles, the difference is 35 pebbles. This difference is not changed by putting 10 more pebbles in each box, nor by taking 30 pebbles out of each box. However, in this illustration, not more than forty pebbles could be taken from each box.

In preparing numbers for subtraction, follow the advice given in addition.

Since numbers increase from right to left in place value, for convenience begin at the right to subtract. Let the student state carefully the convenience.

ARITHMETIC COMPLEMENT.

The difference between any number and a unit of the next higher order is called the arithmetic complement of that number. Thus, 3 is the arithmetic complement of 7; 8 of 2; 11 of 89; 51 of 49; 120 of 880; 1001 of 8999.

THE OPERATION OF SUBTRACTION.

Find the difference between 431,082 and 48,635.

431,082--------Minuend.
48,635--------Subtrahend.

382,447--------Remainder.

5 units cannot be taken from 2 units; by Principle IV the same number may be added to the minuend and subtrahend without changing the remainder. In this case add 10 units to the minuend and its equal 1 ten to the subtrahend. Now 5 units from 12 units leaves 7 units, which write in the proper place. In tens' column now 4 tens from 8 tens leaves 4 tens. Now add 10 hundreds to the minuend and its equal 1 thousand to the subtrahend; 6 hundreds from 10 hundreds leaves 4 hundreds. Not 8 thousands from 1 thousand, but 9 thousands from 1 thousand cannot be taken; hence add 10 thousands to the minuend and 1 ten-thousand to the subtrahend. 9 thousands from 11 thousands leaves 2 thousands. 5 ten-thousands from 43 ten-thousands leaves 38 ten-theousands.

This explains the somewhat prevalent practice of adding 1 to the next order in the subtrahend instead of subtracting 1 from the next order in the minuend, when a given order in the subtrahend contains more units than the corresponding order of the minuend.

MULTIPLICATION.

Multiplication is a short method of addition when the numbers to be added are equal. This is a good definition so far as the fact is concerned, but it does not help the student in obtaining results.

Multiplication is the process of taking one number as many times as there are units in another. The definition is found often in text-books, but it will not hold except where the multiplier is a positive integer. Multiply 15 by 3/4. There are 3 units in the multiplier, and 3 times 15 are 45, which is not the true product. Multiply 15 by—3. There are 3 units, each —1, and 3 times 15 is 45, which is not the true product.

Multiplication is the process of performing that operation upon one of two numbers, called the multiplicand, which is performed upon unity (1) to produce the other, called the multiplier. The number which is the result of the operation is called the product.

This definition is patterned after that of Charles Smith, and fulfills the requirement when the multiplier is a simple position or negative number, when it is fractional, and when it is complex. It is an excellent one to use in the proofs of the three general problems in multiplication of fractions.

There are three ways of finding how many primary units there are in a certain number of times a given number. The result ma be found by counting, by addition, and by multiplication.

The operation of multiplication is always possible, except f the limitation implied under the first of the following principles:

PRINCIPLES OF MULTIPLICATION.

I. The multiplier is always a pure number (abstract). Su an expression as 5 lb. multiplied by 3 ft. is absurd.

II. The product is always of the same kind as the multiplic This grows out of Principle II in addition.

III. The product of two numbers is the same whichever ber is made the multiplier. 3x4 equals 4x3. The product is 1 either case. 12 trees may be arranged in an orchard as is show

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be performed. Subtractions and divisions cannot always be performed numerically. The fact that the latter are thus limited gives rise to other than positive and integral numbers. Negative and fractional numbers have their origin in impossible subtractions and divisions respectively.

PRINCIPLES.

I. If the dividend and divisor are like numbers, the quotient is a pure number (abstract). If the divisor is a pure number (abstract), the quotient is like the dividend. In any instance the remainder is like the dividend.

II. If each of the several parts of the dividend be divided by the divisor, the sum of the partial quotients is equal to the true quotient. This is known as the Distributive Law of Division. Thus, 216 divided by 18 equals 12. It is easily shown that 18 can be subtracted from 216 exactly 12 times, hence, 12 is the true quotient. Now 216 equals 126 plus 54 plus 36. 126 divided by 18 equals 7; 54 divided by 18 equals 3; 36 divided by 18 equals 2. 7 plus 3 plus 2 equals 12.

III. If the dividend and divisor be multiplied by the same number, or divided by the same number, the quotient remains unchanged. Thus, 48 divided by 12 equals 4. Now divide both 48 and 12 by 3, and the problem becomes 16 divided by 4 equals 4, which result is the same as at first. Or, 36 divided by 12 equals 3. Now multiply both 36 and 12 by 3, and then the problem is 108 divided by 36 equals 3.

BEGIN AT THE LEFT TO DIVIDE.

Since numbers decrease from left to right in place value, for convenience begin at the left to divide, so that if at any time there should be a remainder it may be reduced to a lower denomination and combined with the units of that denomination to form a new dividend. In very early times this new dividend was called a *dividual.*

SHORT DIVISION.

Short division should precede long division. Great proficiency should be attained in short division with divisors from *one* to *nine* inclusive. If this is practiced sufficiently, the habit of dividing such numbers as 24,382 by 2 by long division will cease. There is less probability of error in short than in long division, when the divisor is a small number.

When the divisor is too large to admit of short division at one operation, it is very frequently convenient to factor the divisor and then proceed by short division.

CASTING OUT NINES.

Every number may be regarded as equal to some multiple of 9 plus some remainder. Thus, 13 equals 9 plus 4; 26 equals 9 x 2 plus 8; 61 equals 9 x 6 plus 7; 111 equals 9 x 12 plus 3; 321 equals 9 x 35 plus 6; 36 equals 9 x 4 plus 0; and 5 equals 9 x 0 plus 5.

The remainder found by dividing any number by 9 is called the Excess of Nines of that number. The excess of nines of any number is the same as the excess of 9's in the sum of the digits of that number. Thus, 574 equals 9 x 63 plus 7. The sum of the digits 5, 7, and 4 equals 16. 16 equals 9 plus 7.

1385 equals 9 x 153 plus 8. 1 plus 3 plus 8 plus 5 equals 17. 17 equals 9 plus 8.

This truth may be applied to test the accuracy of the result in any one of the four fundamental processes of arithmetic.

ADDITION.

The number of 9's in the sum of two or more numbers equals the sum of the 9's in them taken separately plus the number of 9's in the sum of the excesses.

Hence, the excess of 9's in the sum of two or more numbers equals the excess of 9's in the sum of the excesses.

29,342----2
84,083----5
8,756----8
72,345----3
93,124----1
287,650 19

The excesses of 9's in these numbers are respectively 2, 5, 8, 3, and 1, and their sum is 19. The excess of 9's in 19 is 1, and the excess in 287,650 is 1 The addition may be considered correct.

SUBTRACTION.

Since subtraction is the inverse of addition, if the excess of the sum of the excesses of the subtrahend and remainder equals the excess of the minuend, the subtraction may be considered correct.

29,341----1
3,872----2
25,469 8

MULTIPLICATION.

Since 325, or a multiple of 9 plus 1, is multiplied by 245, or a multiple of 9 plus 2, the product contains a multiple of 9 plus 1, first multiplied by a multiple of 9, and then multiplied by 2. Hence, the product contains a multiple of 9 plus the product of 1 x 2.

325 x 245 equals 79,625.
Multiplicand 325----1
Multiplier 245----2
79,625 2

The excess of 9's in any product equals the excess in the product of the excesses of the multiplicand and multiplier.

When this is true the multiplication may be considered correct.

DIVISION.

Since division is the inverse of multiplication, the excess of the dividend equals the excess of the product of the excesses of the divisor and quotient. If there be a remainder, the excess of the dividend equals the excess of the product of the excesses of the divisor and quotient plus the excess of the remainder.

185,504 divided by 496 equals 374.
Dividend 185,504----5
Divisor 496----1
Quotient 374----5

(Note: The method by casting out 9's is not always a test of accuracy).

2,937----3
8,654----5
12,491----8

The excess in these numbers are 3 and 5, and their sum is 8. 8 is also the excess in 12,491; but 12,491 is not the true sum of these numbers.

PRECEDENCE OF SIGNS.

No notice need be taken of the order of additions and subtractions. When expressions contain all of the signs of the four fundamental operations those of multiplication and division must be performed before those of addition and subtraction, except when otherwise indicated.

CHAPTER IV.

Arithmetic in the Primary Grades.

METHOD.

In this discussion we treat as the primary grades, the first, second and third grades, and the discussion will be merely for the purpose of outlining the essential points of method to the primary teacher, suggesting some devices that may be used in teaching arithmetic in these grades.

In the primary grades it is essential that the teacher simplify and concentrate the work of the student in arithmetic upon essentials. Avoid wasted effort and attempt to give that training in establishing an attitude toward number so that the work of the following grades may be characerized by continuity and unity. The problem of method in arithmetic, like many other studies, is the problem of mastering and applying principles and combining them effectively into an organized whole. Arithmetic as a science is extremely abstract. The first difficulty that confronts the teacher is how to make concrete the subject matter, and relate it to the child's experience.

As we related in the previous chapter, arithmetic deals with the development of the number idea based upon measurement. Consequently number arises through activity of the mind in dealing with objects. Number is not an attribute to be devised from objects, but rather an attribute to be put into objects; hence to put this attribute into objects, or as we say pedagogically, to develop the concept of number as an attribute of the object, the first step is to employ the thing or object in a constructive way; therefore, the thoughtful physical and mental activity in measuring, comparing and relating objects or parts of a whole, is the source from which number ideas spring.

*"There are several kinds of objective material that may be used as a basis for activity in measuring.

1. One of the first is the counting of physical objects, as chairs, birds, houses, children, apples, fence posts, etc. Children take to this easily before the school age, and it may be continued. It is a crude form of measuring with the eye, the children often pointing at or touching the objects. It soon passes over into mere counting to one hundred, in which they take pleasure.

2. Miscellaneous objects, such as toothpicks, apples, buttons, beads, schoolroom objects, pencils, fingers, may serve at any time to illustrate ideas of number. The teacher should have a stock of these The defects of this class of materials are easily noted: (a) the units things at hand, and should be fertile in finding others at need. are often not of uniform size and quality; (b) they do not illustrate so well the idea of measurement; (c) and they do not furnish natural wholes to be analyzed and recombined.

3. A continuation of the administrative devices used during the first year in developing ideas of number, as the distribution of papers, books, and pencils to pupils, the marking off of positions at the board, the paging of books, counting time on the clock face, the

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*McMurry, Special Method in Arithmetic, Macmillan, pp. 32-37.

attendance record of the school, games in and out of doors, sports (keeping score, jumping, and running). These involve measurement in more definite forms and are closely allied to interesting duties and activities of the children.

In this connection we may also include the abundant and varied number work suggested by and incidental to other studies, as the constructions in drawing lessons, measurements for manual training work, the records of nature study, observations of weather (thermometers), of plants, and animals. In the third grade the beginnings of home geography suggest a multitude of interesting quantitative studies, as houses and buildings, map drawing, etc.

4. The abacus, the counting frame, and the measured cubes and blocks. These are artificial illustrative materials designed in particular for number work. The children themselves can handle the abacus and measure off the combinations, adding, subtracting, dividing and multiplying. The blocks should include sixty inch-cubes of wood, ten parallelpiped blocks of each length, (two-inch, three-inch, etc., to ten-inch). As later explained, these blocks will give relief from the single combinations of the Grube method. The blocks also serve later as an introduction to the computation of surfaces and areas, and as a preliminary to square and cubic measure, and to square and cube root.

5. The standard units of denominate numbers furnish the ideal measuring units. Such are the foot, yard, gallon, pound, dollar, bushel, barrel, day, dozen, cord, cubic foot, etc. The primary school should be supplied with sets of the more common and easily handled of these units, e.g. pint, quart, and gallon cans, peck and bushel measures, foot, yardstick, and tape-line, a pair of scales and set of weights, a clock face with movable hands, calendars, dollars, dimes and pennies, or their imitations. The children in primary grades should handle them freely in actual measurements of distances, heights, liquids, sawdust or sand, weight, and values.

There are several advantages in these standard units. (a) They give free and varied activity in accurate measuring and in percieving of relations. (b) They are common standards used everywhere in this country, and will remain through life the foundation of all sorts of quantitive measurements of material things in all studies and in all experience. There will be nothing to unlearn nor to forget. (c) In relating these standard units to the lesser and larger units in the same scale or table, we secure those common ratios and fractions which will be of greatest service in all later arithmetical work, e.g. in pint, quart, and gallon, 1-2, 1-4, 1-8, 3-4, etc.; in cent and dime, 1-10, 1-5, etc.; in inch and foot, 1-2, 1-3, 1-4, 1-6, 2-6, etc.; in ounce and pound, 1-16, 1-8, 1-4, 8-16, etc. These ratios include all the number combinations from 1 to 10, except those in 7 and 9. These tables bring out concretely also the relations of many numbers from 10 to 100 and 2000, including the series of the decimal scale in United States money.

6. In the second grade, number pictures expressed by dots or lines in proper arrangement have served well the purpose of presenting number relation sharply through the eye. The use of dominoes and cards serves a similar purpose.

In learning to write numbers at the board or on paper children may use these number pictures and the symbols interchangeably, or as equivalents, with a much clearer perception of the meaning of the corresponding figures.

7. In teaching the decimal scale in third grade, splints or toothpicks, held in bundles of 10's and 100's by rubber bands, are ex-

tremely useful in the first introduction and explanation of the series and the relation of the successive units to one another. Numbers like 23 and 46 can be added, or the difference found, also 825 plus 143. Later 36 plus 78 and 365 plus 247, by separating the bundles into lesser units and recombining them. These operations can be performed by either pupils or teacher until the fundamental idea of the decimal scale is clear. Even simple multiplication and division can be illustrated in this way. No long continued use of the splints for this purpose is necessary, because it is desirable, when the notion of the scale is once clear, to pass over to a quicker and less concrete handling of number relations and processes.

In all these seven modes of making concrete elementary number operation, there is great danger of overdoing the matter by continuing too long in objective work, thus converting it into a routine. In all cases it is necessary to push on to the more rapid and abstract treatment of number, always keeping the way open to a quick return to the concrete, when there is lack of clearness in thinking."

The work of the primary grades must necessarily deal largely with the number ideas of a simple nature and employ the use of number not too high in the scale. For counting purposes the child may learn to count from one to one hundred, but he cannot master the number concept in any thorough manner until his experience has grown sufficiently so that he can employ the number combinations in relating them to objects by means of comparison and measurement. The ability to do this will vary widely among children of the primary grades. Some first grade children may not be able to deal with numbers above twenty, while others may reach fifty or even one hundred. The development of the number concept depends largely upon the units of study employed in teaching the children.

*HELPFUL SUGGESTIONS

"1. The number of children in the school and in different classes. The relative number of boys and girls. The school enrollment and number in attendance. Absences and tardiness.

2. Distributing and collecting materials for class use, as pencils, books, pens, blotters. A monitor for each row can report the number needed for use in his row.

3. Numbering of children at the board or at the seats. Number of seats in each row or places at blackboard.

4. Observe and read the paging of the primer and first reader. Notice number symbols wherever used in any of the studies.

5. In connection with weather study, note clear and cloudy days with colored circles, and work out the records for the week and month. Make a diagram of the thermometer on the board and on paper, and read the markings.

6. In making the clock face, reckon up the hours and minutes. Number of days in the week and month.

7. In the observation of plants and animals, number facts are often of interest, as the number of seeds in pods or parts in flowers, of legs, wings and other organs in animals.

8. Measuring inches with the foot-rule in constructing seed boxes, play and doll houses, envelopes, and in paper folding, cardboard, etc.

9. Games which involve counting, tenpins, marbles, dominoes, card games, and any game where a score is kept.

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*McMurry, "Special Method in Arithmetic," Macmillan, pp. 183-184.

10. Measuring the size of children, calculating ages of children, years and months.

11. Children take pleasure in counting by 1's, 2's, 10's, and occasionally attention should be given it.

12. There are many cases where fractions, halves, thirds, quarters, are used and may require explanation and illustration.

13. Even fables, fairy tales, and myths often bring out number facts."

The next large problem is to determine the order, or systematic treatment of the number facts, and the proper distribution of the fundamental facts and operations. The teacher of the primary grades should remember that it is not so much the emphasis for the development of the reasoning power of the child during the primary grades, as it is the emphasis upon the memory and mechanical phases. In the primary grades the teacher should emphasize drill, the memorizing of addition combinations and multiplication and division tables. Strive to fix the number habit and association, so that when the processes are learned intelligently, the student may then be drilled until the processes become mechanical, automatic.

Too many mistakes in the teaching of arithmetic are made in the early school period because the teacher does not recognize the child's inability to reason or to enter into the solutions of problems that involve a great deal of reasoning power. These mistakes may be overcome if the teacher remembers that the primary period is for the mastery of the simple processes and the simple operations, and is the period for thorough drill. Memory work should characterize this period. Teachers should recognize the fact that the four fundamental processes should not be developed simultaneously, because they are not of equal difficulty; moreover, the child does not need them to an equal degree, and the world of business does not use them with equal frequency. The teacher should start with the counting process, using objects at first and then gradually lead them to counting in the abstract. Then begin the process with addition because it is easiest, most important and most interesting. Later begin with the more easy problems in subtracttion. After a free use of addition, and subtraction, the idea of repeating similar addends a number of times will spring up, thus shortening the process by multiples, introducing multiplication and its inverse process, division.

In the primary grades the great bulk of number exercises should be oral. A few minutes each day spent in rapid reviews and drills on the four fundamental operations will do more than anything else to secure accuracy and speed. The slow pupil should be given time to think, and not be embarrassed or required to keep up a speed with pupils not in his class. Sometimes the pupil slow in beginning proves the stronger and abler in the end.

In making up oral problems the teacher should keep within the child's experience both as it applies to objects and interest. There should be introduced some written work, but the written work must necessarily follow the development of the oral work. I would advise no text-book in the first year and not in the second either, except in the hands of the teacher. Seat work with written problems should be short, not tedious, but of the nature that exact results may be obtained.

In the third grade the teacher should begin the definite work of developing the power among the students to read and interpret simple practical problems. Objects, diagrams, and concrete devices should be used to develop this phase of the subject. The Wheeler Text, Primary Book, is designed to be used in the first four grades; however, the author does not intend that the book be placed in the hands of the pupil before the third year; therefore, the suggestions for the first and second years, and the work as outlined in the text is intended merely for the teacher. The teacher should supply herself with a number of devices in the way of objects, such as dominoes, toy money, pegs, rules, bundles of sticks, pencils or other material of this nature. These will serve to interest the children in the number work.

In the third grade the text may be placed in the hands of the pupil. Here again let me urge that the teacher use the experiences of the child. In beginning with the text use the material that fits into the pupil's needs. Many of the exercises in the first part of the text may be omitted. The teacher should read carefully the instructions given in the chapter on fundamental processes; likewise, that portion found in the outline for the intermediate grades, which discusses the principles of drill. There is not a phase of arithmetic which needs so careful teaching as the drill lessons. Every problem should be related to the child's experience, should involve the application of measurement and comparison, and should have an immediate objective.

The following is a summary of the leading points in the foregoing discussion, which the teacher should observe.

*"1.—Use abundant and varied measurements and concrete illustrations in elementary processes.

The children themselves should use the objects freely and work out the constructions (with blocks) and the measurements (with standard units).

Abandon the use of objects as soon as the ideas are clear, so as to reach more rapid and abstract number manipulations.

2. In primary grades the number work should have a free range within the limits of a child's experience.

3. Perfection in all four operations simultaneously is forced and premature.

4. The starting-point in a number lesson should be some interesting object, not yet clearly defined, but requiring measurement and numerical interpretation.

5. The formation of a series by the analysis of a larger unit, by counting, by addition, etc., gives a mental movement by which attention can be secured.

Later drills, bringing the combinations of the series into irregular order, are necessary.

6. In learning the multiplication table, the natural and easy order should be followed, and the different tables closely compared with one another to discover similarities and identities.

7. Oral number work should predominate in primary grades.

8. Written work at the board and at the seats should acquaint the children with the figures and symbols of operation."

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*McMurry, Special Method in Arithmetic, Macmillan, pp 140-141.

CHAPTER V.

Arithmetic in the Intermediate Grades.

In the intermediate grades we will consider grades fourth, fifth and sixth. The fourth grade is outlined in the Wheeler Text, Primary Book, last portio n. The work for the fifth and sixth grades is found in the Wheeler Intermediate Book.

In the discussion of the work for the intermediate grades we may begin to consider the teaching of the arithmetical processes and their application in a more serious manner. The student in the intermediate grades should master most of the arithmetical processes and operations especially those of a fundamental nature. In these grades the student possesses the ability to begin to generalize and the teacher may apply inductive methods by the use of concrete examples. The teacher may inductively derive and formulate definitions and rules which the student utilizes in later work. Arithmetical processes and their modes of expression are the means by which we give quantative interpretation to the large mass of things and to the active forces in the physical world. The teacher should lead the pupils constantly to measure, compare and simplify number relations. The need of arithmetic in the common affairs of life and the close correlation of its processes with geographical, scientific and economic questions, should justify the selection of many important units as they are applied in community affairs. Consequently the teacher should begin to vitalize the subject matter of arithmetic in the intermediate grades by supplementing the textbook matter with problems taken directly from community life.

*Home Geography Topics.

"Cost per mile of good country roads; cost of local water-works and running expense; the heating of homes and schoolhouses, expenses for furnaces, coal, wood, janitor or engineer.

The outlay in running a local mill or factory, for machinery, wages, insurance, repairs, raw materials, and losses.

Population of the town; school population; number of voters. Population of city and country compared for the county.

Length of chief railroad lines in the state. Time and rate of speed for passenger trains. Cost of tickets for certain distances, between cities.

Trip round the world on the one parallel, marking and comparing distances.

Capital needed in sinking a coal shaft and for machinery and labor in operating a coal mine.

Other similar topics in geography.

Elementary Science.

Quantity of weed seeds destroyed by birds.
Distance to the sun and moon and size of each.
Diameter and circumference of the earth.
Power gained by the crowbar, pulley, and rope.
Power of engines, windmills, and water-wheels.
Comparative weight and value of different metals.
Amount of money wasted in alcoholic drinks and tobacco.
The age of plants and trees.

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*McMurry, "Special Method in Arithmetic," Macmillan, pp 200-201.

History.

Length of chief periods in American history. Chief periods of the world's history; time before and since the birth of Christ. Important dates.

Age of cities and buildings; monuments.

Age of the oldest citizens; oldest houses in the town. Centennial and other celebrations."

In the fourth and fifth grades the processes of multiplication and division are most apt to be troublesome for the teacher. How to teach multiplication when the multiplier has two digits is illustrated on Page 212, Wheeler Primary Book. Here the author recommends the use of the partial product.

Most teachers can develop this by using the longer process, for example: Multiplier 21, multiplicand 27. Step No. 1, multiply 27 by 1, produce 27. Step No. 2, multiply 27 by 20, product 540. Step No. 3 (27 multiplied by 1) plus 27 multiplied by 20 equals the first product, 27, plus second product, 540, or final product, 567. Sometimes this method of drill is very helpful, because after the longer process is taken, the pupil will appreciate the short method.

For the purpose of drill and thorough fastening on the mind of the pupil the table of division and multiplication, it is well to carry the method of short division through the simple problems, involving a divisor of two digits. Let them divide in short division by 10, 11, 12, 14, 15, and 18, but select numbers that contain the divisor an equal number of times. To introduce the long division it is an easy step from short division, using the divisor of two digits. Let the pupil write out the analysis of the problem in short division step by step, then suggest the method of picturing the mental steps by the long division method. As the divisor grows larger it is necessary to write down the product; whereas, in short division these steps and results are carried mentally. Likewise it is necessary to estimate the approximate result by means of a trial divisor. This is usually the stumbling block for the child in long division. The teacher should drill, before any actual work is performed, in having the pupils estimate approximate results by means of a trial divisor. In estimating the approximate result it will be necessary to test the estimate through the first step in multiplication. Example: Use dividend 416; estimate using the divisor, 16. How many 16's in 41; how many 16's in 416. This process will extend through a number of lessons and will involve a distinct comparison between short and long division, developing clearness as to the fundamental nature of the process. In teaching long division the teacher has an opportunity to employ the inductive-deductive treatment. Summarizing, we have the following steps:

[*]"1. A distinct aim, appealing to the children.

2. A review of the kindred familiar topic of short division as an introduction to the main difficulty.

3. A presentation of simple examples, worked out and analyzed, these increasing gradually in difficulty until the knotty points in the process are cleared up. On account of the increasing difficulty of handling large numbers as divisors, many lessons are needed in order to master the more difficult problems.

4. A close examination of the steps in the process of division and comparison of short division with long division, then of the simple and difficult problems of long division with one another, will bring out the identity of the process in all.

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[*] McMurry, "Special Method in Arithmetic," Macmillan, p. 71.

5. The children should be able eventually to give some brief statement of the central idea of long division as a series of distinct partial divisions, and common to all problems.

6. The application of long division to more or less complicated situations in business life, in geography, in social problems, etc."

In the fourth and fifth grades we should cultivate greater insight into the meaning of problems and solutions. Short verbal or written analyses should be employed, and the teacher should be careful not to confuse or discourage the child by insisting on technical language and analysis. However, accuracy in language and in the written explanations of mathematical operations should be strictly attended to. A great deal of harm may be done the child by a loose manner of writing out solutions, because such methods may give rise to many bad mistakes in reasoning which vitiate the pupil's work. A very good example of how such inaccuracies or looseness in method may influence the work is found in the application of the fundamental principles. (A full statement of these principles may be found in the chapter on fundamental processes.) For example: $36.00 multiplied by 160 acres equals the value of the farm; 10 degrees divided by 15 equals 2/3 hrs. These and many other similar inaccuracies are very common and are in direct contradiction to that thought and statement that arithmetic is supposed primarily to cultivate accuracy and straight thinking. Clearness and accuracy should characterize the training of students in arithmetical processes.

In treating the work of the grammar classes we have found occasion to discuss the application of principles and the use of the larger lesson units. Suffice it to say that the teacher needs to be very alert in the methods used in the presentation of process, as well as the methods used in solving the problem. The teacher of the intermediate grades must be an expert teacher in methods of drill. The following illustration taken from Parker's "General Methods of Teaching in Elementary Schools," will assist the teacher in formulating correct methods as well as stimulating interest by the use of mathematical games.

"*__Eleven points of technique in fifth-grade drill with fraction cards.__—Another example of modern drill methods which illustrates the fine technique that a teacher has to develop in using drill cards is found in the game with fraction cards described on page 208. The fifth-grade teacher referred to had a pack of cards containing fractions such as

| 2/9 | | 3/5 |

In carrying on the drill game in multiplying these, each of the following numbered points represents a distinct item in her technique.

1. She stood before the class in such a position that the light fell on the cards so all the pupils could see well and none face a window.
2. She appointed one boy to time the game.
3. She wrote the multiplier, for example, ½, on the blackboard behind her.
4. She made sure that all children understood what they were to do.
5. She then said, 'Ready, go!'
6. She flashed the first card, for example, 2/9, by bringing it

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*Parker, General Methods of Teaching in Elementary Schools, Ginn & Co., pp. 250-254.

from back of the pack to the front. The first child gave the answer as quickly as he could say it.

7. (a) If his answer was correct, she flashed the next card to the front of the pack. (b) If his answer was incorrect, the next child gave the answer, the card was dropped on the desk for future use, and the next card flashed.

8. This process continued around the class until the whole pack of cards was used.

9. She then picked up from the desk the cards to which incorrect answers had been given, and flashed them again, calling on the pupils who had missed them if she could remember without hesitation who they were.

10. She then asked the timekeeper for the time consumed and wrote it on the board, for example, '3 min. 30 sec.,' under the record of the previous day for the same pack of cards, and opposite the record of '3 min. 25 sec.' made by another group of children.

11. She concluded with remarks intended to arouse interest in improving the record until it equaled a standard score, such as three minutes for this pack.

Six minutes, fifty problems, zeal and attention, application.—The total amount of time consumed in this drill in getting the class ready, flashing the cards, writing the record on the board, and making remarks about it was about six minutes. During this period nearly every child in the group of twenty-two was called on three times, and the total number of problems correctly worked was about fifty. Practically every child was attentive to each of these because of the intense interest in improving the score. After this drill, problems of areas, requiring the use of fractions in square measure, were assigned.

From group practice to individual practice.—Both of the examples of drill method given above illustrate group recitations in which the whole class gives attention to a common center. We shall now give two examples in which the children work as individuals.

Addition combinations to 9 plus 9 to be said in thirty seconds.—Our first example of individual drill occurs in the third grade where children memorize for rapid oral reproduction all the forty-five addition combinations up to 9 plus 9. These are all printed or mimeographed on a sheet of paper, in mixed order, making five rows similar to the following:

5	7	3	9	8	4	6	7	2
2	4	6	7	1	3	9	1	3

A copy of the sheet is given to each pupil after the teacher is sure that the combinations are generally understood. The technique in this case is also somewhat complex. The ultimate achievement expected of each child is ability to give orally the answers to all the combinations in any order on the chart, up or down, from left to right or right to left, in thirty seconds. Every day some children are given trials and their records kept; for example, a child may in the beginning require forty-five seconds, decrease rapidly in a few days to thirty-seven seconds, but not reach the desired goal of thirty seconds for many lays. Practice is given by concert drills and individual drills in school, and the children are urged to repeat the answers to someone at home who will time them and correct them.

Systematic and thorough; saves time from useless responses; analyzes and corrects wrong inner responses.—The outcome of the device is automatic skill in using rapidly these combinations in problems involving addition. The device is systematic and thorough in achieving this end, since it gives drill on all these combinations. It saves time in many ways. For example, it eliminates the time consumed in the old-fashioned drills by the teacher's saying, ‘What is 6 and 9, Johnny?’ and waiting for Johnny to wake up and reply. It saves Johnny the time of saying ‘9 and 6 are. He merely says ‘fifteen’ as quickly as he can when he sees $\begin{matrix}9\\6\end{matrix}$ on the paper. Moreover, in Johnny's after life it saves him from saying ‘9 and 6’ thousands of times; instead, when he encounters $\begin{matrix}9\\6\end{matrix}$ in an addition problem he merely thinks ‘fifteen,’ just as he thinks ‘cat’ when he sees the word, instead of thinking ‘c-a-t.’ In order to make sure that each child does read off each answer in this automatic way, without going through some roundabout process, the teacher has to make a careful study of the children who are slow in learning to repeat the combinations in the desired time. For exmaple, one such child was found who, when adding $\begin{matrix}9\\7\end{matrix}$, instead of merely recalling the answer 16, thought of it as follows: 9 plus 2 plus 2 plus 2 plus 1 equals 16. The teacher had to break up this habit and get the child to think automatically $\begin{array}{r}9\\7\\\hline 16\end{array}$.

Printed sheets cf problems for fundamental processes; timed tests, individual practice, self-correction, individual advancement.—The second example of individual drills is an elaborate extension of the above type of device to the working of all kinds of problems in adding, subtracting, multiplying, and dividing; the problems being printed on sheets or cards ready to be distributed to the pupils. For example, each pupils may be given a sheet or card printed full of such problems in addition as the following:

6	4	3
5	8	8
1	2	6
—	—	—

All he has to do is to write the answers as rapidly as he can on transparent paper or through holes which are perforated in the problem card. He does not begin to write until the teacher gives the signal for the whole class to begin. At the end of seven minutes the signal may be given to stop. All pupils then cease work. They may turn the problem cards over to compare their answers with the correct ones, which may be printed on the back of the cards, or they may use some other device for self-correction. Each pupil makes a record of the number of problems which he has right. If he has completed all the problems correctly, in the allotted time, he is given a different card of problems to work next time. The children who do not have satisfactory scores on the first card may practice on it during study periods until the next timed test on it is given, when they are tested on it again, at the same time that other pupils are tested on the lessons to which they have progressed.”

Summary of Principles.

*“1. Only correct practice makes perfect.
  a. Make a correct start.
  b. Subordinate speed to accuracy.

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*Parker, General Methods of Teaching in the Elementary Schools, Ginn & Co., pp. 263-264.

2. Avoid unnecessary processes.
3. Arouse zeal and interest.
4. Use ready-made scientific drill systems.
5. Drill till standard scores are maintained.
6. Apply abstract forms in concrete situations."

The teacher should acquaint herself with the scientific tests that have been made in the field of arithmetic. The biblography given at the end of the next chapter suggests several treatises touching this subject. No teacher of today can be up-to-date unless she is familiar with the most recent discussions on the subject of teaching arithmetic.

In the intermediate grades the teacher should begin the use of standard tests and the use of drill material. Much wasted time and much of the discouragement which comes both to teacher and pupil may be eliminated by the use of diagnostic tests which serve the same purpose as the diagnosis of the physician; namely, to find out the "trouble with the patient." In the coaching classes in the Tulsa City Schools, which classes are made up largely of children who are behind in arithmetic, the teachers found that the pupils were weak in the tables, multiplication and division. After diagnosing and eliminating the trouble with a great group of these pupils it was found that the difficulty arose with a certain few combinations which when the pupil had mastered, removed all difficulty. In many cases the student was placed back in his class with increased confidence in arithmetic, which in turn seemed to increase the confidence of the student in the other work. We have some cases in which the records show, that after removing the difficulty in arithmetic the student became one of the best in his class. Eighty per cent of the students in the Tulsa City Schools failing in arithmetic have been restored to their classes after receiving special assistance in overcoming a few obstacles of the tables. The following are the combinations which seem to give most trouble:

Addition combinations:

9	8	6	8	9	7	9	9	9
4	5	7	6	5	8	6	7	8

Subtraction combinations:

13	13	13	13	13	13	14	14	14	14	15
—9	—4	—8	—5	—6	—7	—8	—6	—9	—5	—7

15	15	15	16	16	17	17
—8	—9	—6	—9	—7	—8	—9

Multiplication combinations:

6	6	7	6	7	7	8	8	9	9
×7	×8	×7	×9	×8	×9	×9	×8	×7	×9

In the third and fourth grades many children have difficulty in learning these:

6×3, 7×3, 8×3, 6×4, 7×4, 8×4, and 9×4.

In Chapter III. are given the principles of the fundamental processes together with illustrations which the teacher may find very helpful in promoting concise and accurate work by the student.

The following contains a number of suggestions for teaching arithmetic in the intermediate grades:

*"Instruction in arithmetic has two chief phases: first, the derivation of the general processes; second, the application of these processes to important affairs.

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*McMurry, "Special Methods in Arithmetic," Macmillan, pp. 142-145.

2. The introduction to any process or unit of study should be an interesting aim which focuses thought in the direction of the main idea.

3. Keep up a close connection between a new lesson and preceding related work. The old processes interpret the new. The failure of teachers to discover this close dependence of succeeding topics is one of the weakest points in teaching. It is the special function of the teacher to bring these hidden connections to the attention of thoughtless children, to review and emphasize them.

4. Illustrate principles at first with simple oral problems, based often upon the measurement of concrete objects at hand. Do this till children work with understanding and ease. In making up oral problems bring in constantly, the familiar experiences and surroundings of the children.

5. Give sharp review drills daily in oral work to establish complete mastery of elementary combinations and processes. In this kind of work one can aim at accuracy and speed.

6. A written problem worked out at the board by the teacher before the children, with questions and answers, is one of the best means of introducing a new process or of assigning a lesson upon a series of problems.

7. Careful and complete forms of analysis should be preceded by the working out of many simple oral and written problems till the processes are first clear. The main point is to see that a child is thinking clearly, and this the teacher can find out by definite questioning.

8. In working a class together at the board, have children obey orders quickly. Do not let them write till they have imaged clearly the thing to be written. Produce a strong effort for accuracy and quickness. Require board and seat work to be clear, neat, and legible.

9. In teaching a new process compare the modes of solving several similar problems (oral and written), and let the children discover a common movement. This self-activity in thoughtful comparison is much neglected. Instead of it children accept the teacher's explanation and work mechanically.

10. Rules of operation were formerly given too soon. Oftentimes now they are not given at all. But a simple statement after proper comparisons and inductions is desirable.

11. The application of number processes to practical life is one of the chief aims of arithmetic, but over-technical, difficult, and artificial problems should be omitted.

The working out of a group of related problems bearing upon some large unit of study in geography, history, or science gives a much-needed illumination of such topics from the numerical side. Such problems are easy for children and furnish strong motives to effort because of the interesting and valuable answers they lead to.

12. A good text-book is necessary for both teacher and pupils. Teachers should study carefully the preface, plans, and notes of the author so as to discover his general arrangement and controlling ideas.

It is extremely difficult to grade a text-book so carefully that the children can work the problems without help from the teacher. Additional introductory oral problems, derived from local surroundings, are especially needed as a supplement to the book.

Inexperienced teachers generally move far too rapidly through the book.

The text-book is not to be blindly followed, but supplemented in the oral and inductive work, while it may be modified or reduced in some of its topics."

The Wheeler Graded Arithmetic, Intermediate book, is used in the fifth and sixth grades; the fifth year work dealing largely with fractions an dthe sixth, with the work of decimals. Each year's work is supplemented with material and denominate numbers and practical measurements. In the preface the author states that the book is designed to introduce the student to the more simple problems of home and business relaions; that it provides for abundant oral drills; that it has a wealth of concrete applications; that it is closely connected with the child's environment and is altogether free from obsolete and puzzling topics. In this respect the text is splendidly arranged for the use of the teacher. However the teacher will need to supplement the text for the game material, and for standard material for the drill work.

The first part of the text is a mere repetition of a great deal of the ground covered in the preceding year's work, but becomes more extensive. The teacher should refer constantly to the chapters on aim and content, and to the chapters on the fundamental processes for suggestions in presenting the first part of the fifth year work. In the sixth year work it is recommended that the teacher study carefully the text for the seventh and eighth grade, in order that the point of view as well as the nature of the work in the following subjects may be known; percentage, and certain parts of denominate numbers particularly that referring to the measurements of length, surface and volume.

In the sixth grade work the chief problem for the teacher is the teaching of decimal fractions. The present day business world uses more decimal fractions than common fractions. Percentage, rate of interest, taxation, in fact most matters pertaining to the business world are usually computed or calculated by the use of decimal fractions. The beginning point in the work is the relation of decimals to common fractions. The following lesson plan will help to suggest the method of beginning the work.

LESSON PLAN.

Topic: Decimal Fractions.

Teacher's Aim: To lead pupils to understand in an introductory manner decimal fractions; their nature, notation, numeration.

Pupil's Aim: To learn to read decimal fractions and write them as well as to distinguish their value.

Basis: The pupil's knowledge of common fractions.

Time: Three or four twenty-five minute recitation periods.

I. The relation of decimal fractions to common fractions.

1. What is a fractional unit? Name the largest.
2. What fractional unit divides the integral unit into ten equal parts?
3. What are these parts called? (decimal div.) Teachers show meaning of the word decimal.
4. Show the three ways of writing decimals div. Illustrate: nine-tenths, 9/10, .9; nine-hundredths, 9/100, .09. Which does not have the denominator expressed? How is the denominator indicated? Teacher bring out the relation of the right hand figure of numerator with reference to decimal point. (Illustrate tenths, hundredths, etc.)
5. What is the largest decimal unit? (1/10) Multiply this denominator by ten once, twice, three times, etc. Teachers

bring out decimal units have the denominator 10 or its power. Illustrate: U. S. Money, write the parts of one dollar decimally: $1.00; one dime; one cent; one mill.

II. Decimal fractions defined:

1. What kind of fractions do not have their denominator expressed?
2. What is used to show they are fractional numbers?
3. What part is expressed?
4. How does this indicate the denominator? Illustrate: the fractional unit 1/10 has one naught in the denominator, 1/100 two naughts, etc. Teach the position of the right hand figure of numerator with reference to the decimal point indicates the denominator, e. g. 1 tenths, .1; twelve tenths, .12, etc. DEFINE: A decimal fraction is a fraction whose denominator is not expressed but which is indicated by the position of the right hand figure of the numerator with reference to decimal point (given later). (Test by writing either numerator or denominators.)

III. Notation and Numeration:

1. What is the first decimal place called? the second? (Drill on first six places thoroughly.)
2. Write decimals—change to common fractions—count decimal places. Count naughts in denominator. Bring out: "Every decimal contains as many decimal places as there are naughts in the denominator of the equivalent fraction." Drill on space idea—tenths (1) hundredths (2) thousandths (3) millionths (4) hundred millionths.
3. Read (a) integer; (b) decimal denominator; e. g. .0065, (c) 1. sixty-five, 2. four places, ten thousandths. Teacher practice on (a) and (b) separately until place relationship is fixed.
4. The mixed decimal—the word "and" fixes the decimal point. (Teacher drill on this idea.) Be sure to fix the idea that the position of right hand figure of numerator (integer) indicates the denomination of decimal, e. g. 5th—hundred thousandts, 7th—ten millionths.
5. Write: Drill the fundamental notions already brought out. Tests: Write five hundred tenths; 1000 thousandths; one thousand and one thousandths; 1000 and one thousandth.

CHAPTER VI.

Arithmetic in the Department and Junior High School.

Arithmetic in the departmental grades and junior high school is a subject which becomes most useful in its application to daily life. In the primary and intermediate grades most of the time is spent in mastering number facts and processes laying the foundation for work in the upper grades. The great difficulty in teaching arithmetic is the fact that it is taught from the text book. It is to be regretted that it is necessary to have a text book for a teacher in these grades for if the text book could be thrown to the winds and the teacher placed upon her own resources to gather material and to organize it, we would then be sure that the subject matter would meet the immediate need of the class and would at once become increasingly interesting. Unless arithmetic can become the means of better understanding the world about us in its material aspects, we do not justify the expenditure of energy necessary to master the mechanical processes.

If a teacher desires to vitalize arithmetic, it should be carried into the life of the child. Studying the Niagra Falls is as much a mathematical problem in comprehending its great potential power as it is a study of dynamics of force; building the great Roosevelt Dam was as much a feat in mathematics as it was in engineering, so with the many opportunities offered us we should be able to give a child material taken from the industries, from various productive enterprises and from projects in which he has a natural interest, of agriculture, banking, transportation, stocks and bonds and household accounting.

In teaching these various methods, it is important that the teacher and pupil formulate rules based upon community practice rather than rules for arithmetical processes. If in computing the rate in profit or loss it is the custom of the community to base the rate of profit or loss upon the selling price it should be the duty as a good teacher to acquaint pupils with the custom and let it be presented in the arithmetic work. Such topics of life as the family budget, and personal budgets are particularly influenced by the cost of living in different communities. The present time seems to be very abnormal in this instance. It would be well to define scientifically the facts concerning this budget to keep them up to date.

Just now the federal census is important. This will offer a wealth of material as soon as it is published. It could be used by the teacher to support the work in geography, history and science. Topics of government, commerce, national production, world geography and social economics are always interesting to the children if they be brought within their scope of understanding. It is for this reason that the teacher should lay aside the text book when it fails to fit, study the community or use supplementary material.

Besides giving arithmetic its practical setting, it is necessary that the teacher of the higher grades determine the weakness and administer the remedy for strengthening students in this subject. Upper grade pupils are weak chiefly for two reasons (a) carelessness and inaccuracy in fundamental processes; (b) a lack of individual power, initiative and self-reliance in attacking and solving problems. These conditions of weakness should be removed. If the teacher will turn to Chapter II on Aim and Content, she will find very valuable suggestions in the manner and method for overcoming these difficulties.

Much time is spent by the teacher in the upper grades in having the pupils fish for solutions of problems rather than having them think problems. A great deal of time should be spent in developing initiative in attacking problems, in analysis, for understanding the facts given and the facts to be obtained. This may be done by both oral and written arithmetic. In fact, most teachers spend too much time having the pupils do with pencils what they should do mentally. The teacher should never be guilty of aiding the pupils, as Colonel Parker has said, so that "they are helped into helplessness." Most pupils need help but it should be along a line of fundamentals and principles. The pupil should be made conscious of his own resources; he should develop largely the power and the readiness to grapple with difficulties and to attack problems.

If the teacher of the departmental grades is able to train her pupils to think straight, to calculate accurately and to apply number concepts judiciously she has accomplished more for her pupils than the mere mastery of all the mechanical processes.

In the upper grades, discussion, testing, and experimenting, should be made use of. Reviews are valuable but should be the means of a new attack on subject-matter. In the upper grades consideration is necessary for the wide range of individual differences and for this reason arithmetic teaching might well be both individaul and class work. Such teaching should carry to the pupils the complete organization and unity of the subject. I should discourage the assignment of lessons which require outside-of-school-time for study. Since the best opportunity for determining individual differences is in the study period, the teacher should make preparation for supervised study during the school day.

Summarizing we have the following points to be observed:

"The emphasis of grammar school arithmetic should be placed upon the application of familiar processes to the whole range of important topics in the school course which require numerical interpretation.

A group of related problems bearing upon one important topic need not be difficult, and leads to interesting and important results.

2. Carelessness and inaccuracy in fundamental operations are common with grammar school pupils. They may be overcome in part by brisk and varied oral drills. Mental arithmetic is of great value in developing power, accuracy, and quickness.

3. In grammar schools especially children should learn to overcome difficult problems by their own resources. Our graded schools often show a remarkable weakness in this respect.

One of the most delicate and diplomatic undertakings of the teacher is to steer wisely along the middle line between helping too much and too little.

We can afford to spend more time and work more cautiously with children when they are struggling with the general thought side of a problem. Figuring is much easier.

The concentration of mathematical processes upon large and important topics, and the working out of significant results, give strong motive to number work.

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*McMurry, "Special Method in Arithmetic." Macmillan, pp. 145-147.

4. It is very difficult to avoid extremes in method, to bring all the leading principles to a proper adjustment and balance.

5. Our present text-books, by enlarging some of the leading topics, geographical, economic, etc., should be so used as to help in making the transition to the treatment of larger practical topics.

6. The grammar grades furnish the most varied opportunities for reviewing, mastering, and applying all the elementary processes, and for a deeper insight into their unity and the underlying coherency of the parts.

7. The teacher should be flexible and rationally sympathetic in adapting his standards to the varying ability and needs of the children.

CHAPTER VII.

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CHAPTER VIII.

Solutions.

PAGE 8

(1)—Debit	$17.15
Credit	5.25
Balance	11.90

(2)—Debit	$67.85
Credit	27.70
Balance	40.15

PAGE 9

(3)—Debit	$4.80
Credit	2.65
Balance	2.15

(4)—Debit	$5.74
Credit	5.00
Balance	.74

PAGE 10

(1)—Sugar	$ .38
Lard	.70
Soap	.30
Molasses	.25
Rice	.36
Flour	1.40
Soup	.12
	$3.51

(2)—Flour	$ .60
Rice	.35
Soap	3.95
Potatoes	1.25
Cocoa	.35
Olive oil	.80
Corn flakes	.30
	$3.95

(3)—2 lbs. steak @ .35	$ .70
3 pkgs. oatmeal @ .10	.30
1 bot. bluing @ .15	.15
1 bot. vanilla @ .45	.45
3 lbs. rice @ .18	.54
4 lbs. starch @ .10	.40
1 bu. potatoes @ .95	.95
	$3.49

(4)—15 lbs. chops @ .30	$4.50
10 lbs. cornmeal @ .08	.80
100 bars soap @ .04	4.00
5 doz. Dutch Cleanser @ .95 per doz.	4.75
20 lbs. cocoa @ .27	5.40
100 lbs. coffee @ .28	28.00
1 doz. pkgs. table salt @ .20	2.40
	$49.85

PAGE 11

(1)—6 dining room chairs @ $5.50	$33.00
1 buffet	75.00
1 Axminster rug	42.50
	$150.50

(2)—24 brass beds @ $16.25	$ 390.00
24 bureaus @ 21.50	516.00
24 chiffoniers @ 15.75	378.00
24 Brussels rugs @ 19.40	465.60
145 yd. Axminster carpet @ 1.00	159.50
	$1909.10

PAGE 12

(3)—	1 dining table	$ 45.00
	8 dining chairs @ $7.	56.00
	1 buffet	87.50
	1 serving table	35.00
	1 rug	52.50
	1 library, 3 pc. suit.	115.00
	1 library table	45.00
	1 mahogany rocker	21.00
	1 wicker rocker	13.50
	1 Axminster rug	67.50
	1 Wilton rug	87.50
	1 hall runner 6 yd. @ $2.25 per yd.	13.50
		$639.00

(4)—	50 men's overcoats @ $17.50	$ 875.00
	150 men's suits @ $21.50	3225.00
	200 boys' suits @ $6.75	1350.00
	150 young men's suits @ $18.75	2812.50
	300 knit sweaters @ $4.20	1260.00
		$9522.50

(5)—	50 doz. suede gloves @ $15.50 doz.	$ 775.00
	300 pairs silk hose @ $1.25	375.00
	125 georgette crepe blouses @ $3.25	406.25
	60 serge capes @ $13.75	825.00
	48 foulard dresses @ $21.50	1032.00
	200 gingham house dresses @ $3.75	750.00
		$4163.25

(6)—	10 tennis nets @ 4.50	$ 45.00
	6 tennis r'c'kt's @ 4.75	28.50
	5 golf clubs @ 3.25	16.25
	10 baseball bats @ .75	7.50
	5 doz. baseballs @ 9.00 per doz.	45.00
	4 catcher's gloves @ 4.25	17.00
	10 fielder's gloves @ 2.35	23.50
	3 catcher's pads @ 4.75	14.25
	2 catcher's masks @ 2.75	5.50
		$202.50

BOARD MEASURE.

PAGE 14

1. 12′×1′×1″=12 board feet
2. 14′×1′×1″=14 board feet
3. 12′×5/6′×1″=10 board feet
4. 14′×5/6′×1″=11 2/3 board feet
5. 12′×3/4′×1″= 9 board feet
6. 14′×5/6′×1″=11 2/3 board feet
7. 12′×2/3′×1″= 8 board feet
8. 14′×3/4′×1″=10 1/2 board feet
9. 10′×2/3′×1″= 6 2/3 board feet
10. 10′×1/4′×1″= 2 1/2 board feet
11. 12′×1/4′×1″= 3 board feet
12. 12′×1/3′×1″= 4 board feet
13. 12′×1/2′×1″= 6 board feet
14. 14′×1/4′×1″= 3 1/3 board feet
15. 14′×1/2′×1″= 7 board feet
16. 14′×2/3′×1″= 9 1/3 board feet
17. 8′×1 1/4′×1″=10 board feet
18. 8′×1 1/3′×1″=10 2/3 board feet
19. 8′×1 1/4′×1″=10 board feet
20. 10′×1 1/4′×1″=12 1/2 board feet
21. 10′×1 1/3′×1″=13 1/3 board feet
22. 10′×1 1/2′×1″=15 board feet
23. 12′×1 1/4′×1″=15 board feet
24. 12′×1 1/2′×1″=18 board feet
25. 10′×1′ ×2″=20 board feet
26. 10′×1′×1 1/2″=15 board feet
27. 10′×1′×2 1/2″=25 board feet
28. 12′×1′×3 ″=36 board feet
29. 12′×5/6′×1 1/2″=15 board feet
30. 12′×5/6′×2 ″=20 board feet
31. 12′×2/3′×2 1/2″=20 board feet
32. 12′×2/3′×3 ″=24 board feet
33. 14′×1/2′×2 ″=14 board feet
34. 14′×1/2′×3 ″=21 board feet
35. 14′×1/3′×2 ″=9 1/3 board feet
36. 14′×1/2′×2 1/2″=17 1/2 board feet
37. 10 ×10′×5/6′×2″=166 2/3 board feet
38. 12 ×14′×5/6′×2 1/4″= 315 board feet
39. 20 ×12′×5/6′×2 1/2″=500 board feet
40. 16 ×12′×1/2′×4 ″=384 board feet
41. 28 ×14×1/6′×4 ″=261 1/3 board feet
42. 40 ×12′×5/6″×1 ″=500 board feet
43. 60 ×12′×1 ′×1 1/8″=810 board feet
44. 8 ×16′×1 ′×10 ″=1280 board feet

12 ×20′×1/2′× 6 ″= 720 board feet
2×12′×1/2′× 8 ″= 96 board feet
24 ×10′×2/3′× 2 ″= 320 board feet
2416 board feet

2416=2.416M board feet
2.416×$30=$72.48=total cost.

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45. 10 ×10′×1 ′×14″=1400 board feet
4 ×12′×1/2′× 8″= 192 board feet
48 ×12′×1/4′× 8″=1152 board feet
120 ×12′×1 ′× 1″=1440 board feet
4184=total
4184=4.184M
4.184×$32.50=$135.98

46. 4.184×$40=$167.36
4.184×$18= 75.31
$ 92.05 difference.

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(1)— 14′× 12′=168 sq. ft.
1/4 ×168 = 42 sq. ft.
210 sq. ft.

(2)— 15′× 12′=180 sq. ft.
1/4 ×180 = 45 sq. ft.
225 sq. ft.

(3)— 16′× 16′=256 sq. ft.
1/4 ×256 = 64 sq. ft.
320 sq. ft.

(4)— 15′× 12 1/2′=187 1/2 sq. ft.
1/4 ×187 1/2= 46 7/8 sq. ft.
234 3/8 sq. ft.

(5)— 16′× 12 2/3′=202 2/3 sq. ft.
1/4 ×202 2/3 = 50 2/3 sq. ft.
253 1/3 sq. ft.

(6)— 16′× 14 1/2′=232 sq. ft.
1/4 ×232 = 58 sq. ft.
290 sq. ft.

(7)—12 1/2′× 10 1/3′=129 1/6 sq. ft.
1/4 ×129 1/6 = 32 7/24 sq. ft.
161 11/24 sq. ft.

(8)—16 1/3′× 12 1/2′=204 1/6 sq ft.
1/4 ×204 1/6 = 51 1/24 sq. ft.
255 5/24 sq. ft

(9)—16 2/3′× 14 3/4′=245 5/6 sq. ft.
1/4 ×245 5/6 = 61 11/24 sq. ft.
307 7/24 sq. ft.

(10)—15′ × 12′=180 board ft.
1/5×180 = 36 board ft.
216 board ft.
216=.216M
.216×$60=$12.96

(11)— 16′× 14′=224 board ft.
1/5 ×224 = 44 4/5 board ft.
268 4/5 board ft.=.268 4/5M
.268 4/5×$60=$16.13

(12)— 18′× 10′=180 board ft.
1/5 ×180 = 36 board ft.
216 board ft.=.216M board ft.

(13)—12 1/2'× 9 '=112 1/2 board ft.
1/5 ×112 1/2 = 22 1/2 board ft.
135 board ft.=135M board ft.
.135×$60=$8.10
(14)—14 2/3'× 12'=176 board ft.
1/5 ×176 = 35 1/5 board ft.
211 1/5 board ft.=.211 1/5M board ft.
(15)—16' × 14 1/3'=229 1/3 board ft.
1/5×229 1/3 = 45 13/15 board ft.
275 3/15 board ft.=.275 3/15M
.275 3/15×$60=$16.51
(16)—12 1/2'× 10 1/2'=131 1/4 board ft.
1/5 ×131 1/4 = 26 1/4 board ft.
157 1/2 board ft.=.157 1/2M
(17)—14 2/3'× 12 1/3'=180 8/9 board ft.
1/5 ×180 8/9 = 36 8/45 board ft.
217 1/15 board ft.=.217 1/5M
(18)—16 1/2'× 15 1/4'=251 5/8 board ft.
1/5 ×251 5/8 = 50 13/40 board ft.
301 38/40 board ft.=.301 38/40M
.301 38/40×$60=$18.12

PAGE 17

(1),—30'×12'×2=720 sq. ft.=7.2 squares
7.2×900=6480 shingles
6480÷250=25 23/24=26 bunches
(2).—32'×14'×2=896 sq. ft.=8.96 squares
8.96×900=8064 shingles=32 32/175=33 bunches
(3)—35'×16'×2=1120 sq. ft.=11.2 squares
11.2×800=10080 shingles=40 8/25=41 bunches
(4)—42'×15½'×2=1302 sq. ft.=13.02 squares
13.02×900=11718 shingles=46 109/125=47 bunches
(5)—42'×16 2/3'×2=1400 sq. ft.=14 squares
14×900=12600 shingles=50 2/3=51 bunches
(6)—54'×14½'×2=1305 sq. ft.=13.05 squares
13.05×900=11745 shingles=46 49/50=47 bunches
(7)—35 2/3'×12½'×2=891 2/3 sq. ft.=8.91 2/3 squares
8.91 2/3×900=8025 shingles=32 1/5=33 bunches
(8)—40 2/3'×15¾'×2=1282 sq. ft.=12.82 squares
12.82×900=11538 shingles=46 19/125=47 bunches
(9)—60½'×18½'×2=2238½ sq. ft.=22.38½ squares
22.38½×900=20146½ shingles=80 29/50=81 bunches
(10)—28'×12'×2=672 sq. ft.=6.72 squares
6.72×800=5376 shingles=5.376 M.
5.376×$4=$21.50 cost of shingles
6.72×$5.50=$36.96 cost of slate
$36.96—$21.50=$15.46 slate costs more than shingles
(11)—36½'×16 1/3'×2=1192 1/3 sq. ft.=11.92 1/3 squares
11.92 1/3×800=9538 2/3 shingles=9.538 2/3 M.
9.538 2/3×$4=$38.15 cost of shingles
11.92 1/3×$5.50=$65.58 cost of slate
$65.58—$38.15=$27.43 slate costs more than shingles
(12)—45½'×16½'×2=1501½ sq. ft.=15.01½ squares
15.01½×800=12012 shingles=12.012 M.
12.012×$4=$48.05 cost of shingles
15.01×$5.50=$82.56 cost of slate
$82.56—$48.05=$34.51 slate costs more than shingles

(13)—50′×18′×2=1800 sq. ft.=18 squares
18×$6.25=$112.50 cost of tin
1800 sq. ft.=1.8 M. bd. ft. lumber
1.8×$30=$54.00 cost of lumber
112.50 cost of tin
$166.50 total cost of roof.

PAGE 18

(14)—30′×16′×2=960 sq. ft.
12′×16′×2=384 sq. ft.
10′×18′×1=180 sq. ft.
1524 sq. ft.=15.24 squares
$5.20 plus $1.40 plus $1.00 plus $2.25=$9.85 total cost 1 **square**
15.24×$9.85=$150.11 total cost.

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(2)—2×(20′ plus 14′)×8′=544 sq. ft., area of walls
544—100=444 sq. ft.=49 1/3=50 sq. yds.
50÷6=8 1/3=9 bundles of lath
(2)—9×$.45=$4.05 cost of lath
9×$.25=$2.25 cost of labor
$6.30 total cost
(3)—2×(18′ plus 14′)×9½′=608 sq. ft. area of walls
18′×14′= 252 sq. ft. area of ceiling
860 sq. ft. total area
3×7′×4′=84 sq. ft. doors
2×6′×4′=48 sq, ft. windows
132 sq. ft. to be deducted
860—132=728 sq. ft.=80 8/9 sq. yds.
81÷6=13½=14 bundles
14×$.70=$9.80.

PAGE 20

(1)—12′×12′=144 sq. ft.
144÷9=16 sq. yds.
(2)—14′×15′=210 sq. ft.=23 1/3 sq. yds.
(3)—12′×16′=192 sq. ft.=21 1/3 sq. yds.
(4)—14′×16′=224 sq. ft.=24 8/9 sq. yds.
(5)—15′×17′=225 sq. ft.=28 1/3 sq. yds.
(6)—17′×18′=306 sq. ft.=34 sq. yds.
(7)—12′×101/2′=126 sq. ft=14 sq. yds.
(8)—15′×12 7/12′=188 3/4 sq. ft.;20 35/36 sq. yds.
(9)—14′×14 2/3′=205 1/3 sq. ft.=22 22/27 sq. yds.
(10—15′×18 5/6′=282 1/2 sq. ft.=31 7/10 sq. yds.
(11)—17′×21 1/2′=365 1/2 sq .ft.=40 11/18 sq. yds.
(12)—20′×22 1/3′=446 2/3 sq. ft.=49 17/27 sq. yds.
(13)—10 1/2′×12 5/12′=130 3/8 sq. ft.=14 35/72 sq. yds.
(14)—10 2/3′×11 1/2′=122 2/3 sq. ft.=13 17/27 sq. yds.
(15)—12 1/3′×14 2/3′=180 8/9 sq. ft.=20 8/81 sq. yds.
(16)—15 3/4′×16 1/2′=259 7/8 sq. ft.=28 7/8 sq. yds.
(17)—18 1/6′×19 1/8′=351 2/9 sq. ft.=39 2/18 sq. yds.
(18)—20 1/2′×24 2/3′=505 2/3 sq. ft.=56 5/27 sq. yds.

(19)— 2×(10′+12 2/3′)×8′= 362 2/3 sq. ft, area of walls
10′×12 2/3′ =126 2/3 sq. ft. area of ceiling
489 1/3 sq. ft.=54 sq. yds.

54×$.35=$18.90

(20)— 2×(12 1/3′+15 1/2′)×9′=501 sq. ft. area of walls
12 1/3′×15 1/2′ =191 1/6 sq. ft. area of ceiling
692 1/6 sq. ft.=77 sq. yds.
77×$.35=$26.95

(21)— 2×(12 1/2′+16 2/3′)×8′=466 2/3′ sq. ft. area of walls
12 1/2′×16 2/3′ =208 1/3 sq. ft. area of ceiling
675 sq. ft.=75 sq. yds.
75×$.35=$26.25

(22)—2×(13 2/3′+14 3/4′)×9′=511 1-2 sq. ft area of walls
13 2/3′×14 3/4′ =201 5/6 sq ft. area of ceiling
713 5/12 sq ft.=79 13/50 sq. yds.
79 13/50×$.35=$27.75

(23)— 2×(14 5/6′+15 3/4′)×9′=550 1/2 sq. ft. area of walls
16 5/6′×15 3/4′ =233 5/8 sq. ft. area of ceiling
784 1/8 sq. ft.=87 1/8 sq. yds.
87 1/8×$.35=$30.49

(24)— 2×(16 1/2+18 2/3′)×8 1/2′=597 5/6 sq. ft. area of walls
16 1/2′×18 2/3′ =308 sq. ft. area of ceiling
905 5/6 sq. ft.=101 sq. yds.
101×$.35=$35.35

(25)— 2×(18 1/2+20 5/6′)×9 1/2′= 747 1/3 sq. ft. area of walls
18 1/2′×20 5/6′ = 385 5/12 sq. ft. area ceiling
1132 3/4 sq. ft.=125 31/36 sq. yd.
125 31/36×$.35=$44.05

(26)—2×(20 2/3′+22 2/3′)×9 1/2′=823 1/3 sq. ft. area of walls.
20 2/3′×22 2/3′ 468 4/9 sq. ft. area of ceiling.
1291 7/9 sq. ft.=144 sq. yds.
144×$.35=$50.40

(27)— 2×(22 1/3′+24 2/3′×10 1/2′=987 sq. ft. area of walls
22 1/3′×24 2/3′ =550 8/9 sq. ft. area of ceiling
1537 8/9 sq. ft.=171 sq. yds.
171×$.35=$59.85

(28)— 2×(24 1/2′+28 3/4′)×10 2/3=1136 sq. ft. area of walls
24 1/2′×28 3/4′ = 704 3/8 sq. ft. area ceiling
1840 3/8 sq. ft.—204 35/72
204 35/72×$.35=$71.57 (sq. yds.

(29)—2×(14′+10′)×9′=432 sq. ft. area of walls
14′×10′ =140 sq. ft. area of ceiling
572 sq. ft.
572′—76′=496 sq. ft. total area to be plastered
496 sq. ft.=55 1/9 sq. yds.
55 1/9×$.35=$16.53

))— 2×(24′+16′)×9 2/3′=773 1/3 sq. ft. area of walls
24′×16′ =384 sq. ft. area of ceiling
1157 1/3 sq. ft. total area
2×6′×3 1/3′=42 sq. ft. windows
2×7′×3 1/2′=49 sq. ft. doors
91 sq. ft. to be deducted
1157 1/3—91=1066 1/3 sq. ft=118 1/3 sq. yds.
118 1/3×$.35=$41.46

(31)— 2×(25′+25′)×10=1000 sq. ft. area of walls
25′×25′ = 625 sq. ft. area of ceiling
1625 sq. ft. total
Deduct area of openings 144 2/3 sq. ft.
1480 1/3 sq. ft=164.48 sq. yds.
164.48×$.32=$52.63

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(1)— 12′× 15′=180 sq. ft. area of floor
180 ÷250 =.72 gal.
(2)— 14′× 16′=224 sq. ft.
224 ÷250 =.896 gal.
(3)— 15′× 18′=270 sq. ft.
270 ÷250 =1.08 gal.
(4)— 16′× 20′=320 sq. ft.
320 ÷250 =1.28 gal.
(5)— 18′× 22′=396 sq. ft.
396 ÷250 =1.584 gal.
(6)—19′×23′=437 sq. ft.÷250=1.748 gal.
(7)—20′×32′=640 sq. ft.÷250=2.56 gal.
(8)—30′×45′=1350 sq. ft.÷250=5.4 gal.
(9)—35′×60′=2100 sq. ft.÷250=8.4 gal.
(10)—2×(128′+14′)× 9′=2556 sq. ft.=284 sq. yds.×$.20=$56.80
(11)—2×(16′+20′)× 9′= 648 sq. ft.= 72 sq. yds.×$.20=$14.40
(12)—2× (18′+24′)×10′=840 sq. ft.= 93 1/3 sq. yds.×$.20=$18.67
(13)—2×(24′+30′)×12′=1296 sq. ft.=144 sq. yds×$.20=$28.80
(14)—2×(35′+60′)×14′=2660 sq. ft=295 5/9 sq. yds.×$.20=$59.12
(15)—2×(45′+80′)×18′=4500 sq. ft.=500 sq. yds.×$.20=$100
(16)—2×(40′+25′)×10′=1300 sq. ft. walls
40′×25′ =1000 sq. ft. ceiling
2300 sq. ft.=255 5/9 sq. yds.×$.10=$25.56
(17)— 2×(45′+30′)×10′=1500 sq ft. walls
45′×30′ =1350 sq. ft. ceiling
2850 sq. ft.=316 2/3 sq. yd.×$.10=$31.67
(18)— 2×(50′+30′)×12′=1920 sq. ft. walls
50′×30′ =1500 sq. ft. ceiling
3420 sq. ft.=380 sq. yds.×$.10=$38.00
(19)— 2×(60′+35′)×12′=2280 sq. ft. walls
60′×35′ =2100 sq. ft. ceiling
4380 sq. ft.=486 2/3 sq. yds.×$.10=$48.67
(20)— 2×(90′+25′)×14′=3220 sq. ft. walls
90′×25′ =2250 sq. ft ceiling.
5470 sq. ft.=607 7/9 sq. yds.×$.10=$60.78
(21)—2×(120′+40′)×16′=5120 sq. ft. walls
120′×40′ =4800 sq. ft. ceiling
9920 sq. ft.=1102 2/9 sq. yds.×$.10=
($110.22

(22)—1z ×15′=180 sq. ft.÷500= 9/25 gal.×$3.00=$1.08
(23)—14′×16′=224 sq. ft.÷500= .448 gal.×$3.00=$1.35
(24)—14′×18′=252 sq. ft.÷500= .504 gal.×$3.00=$1.52
(25)—15′×18′=270 sq. ft.÷500= 27/50 gal.×$3.00=$1.62
(26)—15′×20′=300 sq. ft.÷500= 3/5 gal.×$3.00=$1.80
(27)—16′×20′=320 sq. ft.÷500= 16/25 gal.×$3.00=$1.92
(28)—18′×22′=396 sq. ft.÷500= .792 gal.×$3.00=$2.38
(29)—18′×25′=450 sq. ft.÷500= 9/10 gal.×$3.00=$2.70
(30)—22′×24′=528 sq. ft.÷500= 1.056 gal.×$3.00=$3.17

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(31)—2×75′×6′=900 sq. ft.÷250=3 3/5 gal.×$1.60..5.76 paint
Cost of labor=3×$5.76= 17.28
$23.04 total

(32—2×90′×5′=900 sq. ft.÷250=3 3/5 gal.×$1.60=$ 5.76 paint
$17.28 labor
$23.04 total

(33)—2×100′×5′=1000 sq. ft.÷250=4 gal.×$1.60=$ 6.40 paint
19.20 labor
$25.60 total

(34)—2×120′×6′=1440 sq. ft.÷250=5.76 gal.×$1.60=$ 9.22 paint
27.66 labor
$36.88 total

(35)—2×250′×5 2/3′=2833 1/3 sq. ft.÷250=11 1/3 gal.
×$1.60=$ 18.13 paint
54.40 labor
$72.53 total

(36) 2×750′×6 1/2′=9750 sq. ft.÷250=39 gal.×$1.60=$ 62.40 paint
187.20 labor
$249.60 total

(37)—Data not sufficient—Omit.

(38)—2×40′×17′=1360 sq. ft.=151 1/9 sq. yds.×$.15=$22.67
=painting roof
2×40′×12′ = 960 sq. ft sides
2×24′×12′ = 576 sq. ft. ends below eaves
2×24′×9′×½= 216 sq. ft. ends above eaves
1752 sq. ft.=194 2/3 sq. yds×$.20=$38.93
=painting walls
$61.60 total

(39)—2×80′×24′ =3840 sq. ft. roof
2×(80′+35′)×20′=4600 sq. ft. sides and ends below eaves
2×35′×15′×½ =525 sq. ft. ends above level of eaves
8965 sq. ft.=996 1/9 sq. yds.×$.20=$199.22

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(1)—2×(14′+12′)=52′—12′=40′=14 yds. to be papered
2×14=28 strips required
24÷8=3 strips per roll
28÷3=9 1/3=10 rolls

(2)—2×(18′+18′)=72′—12½′=59½′=20 yds.
20÷5/6=24 strips required
24÷9=2 2/3=2½ strips per roll
24÷2½=9 3/5=10 rolls

(3)—2×(32′+14′)=92′—22′=70′=24 yds.
24÷5/6=29 strips
24′÷8½=2 14/17=2½ strips per roll
29÷2½=11 3/5=12 rolls for side walls
14′=4 2/3 yds.
4 2/3÷5/6=5 3/5=6 strips
24÷32=3/4=½ strip per roll
6÷½=12 rolls f [illegible] iling

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(4)—4×14′=56′—16′=40′=13 1/3=14 yds.×2=28 strips
24′÷9=2 2/3=2½ strips per roll

28÷2½=11 1/5=12 rolls for side walls
14′=4 2/3=5 yds.×2=10 strips for ceiling
24′÷14=1 5/7=1 1/4 strips per roll
10÷1 1/4=6 2/3=8 rolls for ceiling
12+8=20 rolls×$.25=$5.00
(5)—2×(10′+14′)=48′—12′=36′=12 yds.×2=24 strips
24÷9=2 2/3=2 1/4 strips per roll
24÷2 1/4=10 2/3=11 rolls for side walls
14′=4 2/3=5 yds.×2=10 strips for ceiling
24÷10=2 2/5=2 strips per roll
10÷2=5 rolls for ceiling
11+5=16 rolls×$.35=$5.60
(6) 2×(18′+14′)=64′—24′=40′=13 1/3 yds.×2=27 strips
24÷9=2 2/3=2 1/4 strips per roll
27÷2 1/4=12 rolls×$.50=$6.00 side walls
14′=4 2/3=5 yds×2=10 strips for ceiling
24′÷18=1 1/3=1 strip per roll
10÷1=10 rolls×$.25=$2.50 ceiling
10+12=22 rolls×$.35=$7.70 cost of hanging
$6.00+$2.50+$7.70=$16.20 total

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(1)—12′=4 yds.=4 strips
15′=5 yds.×4=20 yds. of carpet
(2)—15′=5 yds.=5 strips
18′=6 yds.×5=30 yds.
(3)—12′=4 yds.=4 strips
18′=6 yds.×4=24 yds.
(4)—12′=4 yds.=4 strips
16′=5 1/3 yds.×4=21 1/3 yds.
(5)—15′=5 yds.=5 strips
17′=5 2/3 yds.×5=28 1/3 yds.
(6)—18′=6 yds.=6 strips
20′=6 2/3 yds.×6=40 yds.
(7)—14′6″=4 5/6 yds.=5 strips
12′6″=4 1/6 yds.×5=20 5/6 yds.
(8)—18′9″=6 1/4 yds.=7 strips
15′6″=5 1/6 yds.×7=36 1/6 yds.
(9)—20′6″=6 5/6 yds.=7 strips
16′8″=5 5/9 yds.×7=38 8/9 yds.
(10)—15′=5 yds.÷¾=6 2/3=7 strips
12′=4 yds.×7=28 yds.
(11)—18′=6 yds.÷¾=8 strips
15′=5 yds.×8=40 yds.
(12)—18′=6 yds.÷¾=8 strips
12′=4 yds.×8=32 yds.
(13)—12′=4 yds.÷¾=5 1/3=6 strips
16′=5 1/3 yds.×6=32 yds.
(14)—15′=5 yds.÷¾=6 2/3=7 strips
21′=7 yds.×7=49 yds.
(15)—15′=5 yds.÷¾=6 2/3=7 strips
24′=8 yds.×7=56 yds.
(16)—15′=5 yds.÷¾=6 2/3=7 strips
12′8″=4 2/9 yds.×7=29 5/9 yds.
(17)—16′=5 1/3 yds.÷¾=7 1/9=8 strips
20′8″=6 8/9 yds.×8=55 1/9 yds.
(18)—18′=6 yds.÷¾=8 strips
24′6″=8 1/6 yds.×8=65 1/3 yds.

(19)—14′=4 2/3 yds.÷¾=6 2/9=7 strips
16′=5 1/3 yds.×7=37 1/3 yds.×$1.20=$44.80
(20)—18′=6 yds.÷¾=8 strips
16′=5 1/3 yds.×8=42 2/3 yds.×$1.00=$42.67
(21)—15′=5 yds.÷¾=6 2/3=7 strips
17′=5 2/3 yds.×7=39 2/3 yds.×$1.10=$43.63
(22)—15′×12=6 2/3=7 strips
27″
19′=6 1/3 yds.×7=44 1/3 yds.×$1.30=$57.63
(23)—18′×12=8 strips
27″
12′=4 yds.×8=32 yds.×$1.60=$51.20
(24)—16′×12=7 1/9=8 strips
27″
28′=9 1/3 yds.×8=74 2/3 yds.×$1.00=$74.67
(25)—24′×12=10 2/3 =11 strips
27″
26′=8 2/3 yds.×11=95 1/3 yds.×$1.90=$181.13
(26)—24′×12=10 2/3=11 strips
27″
15′=5 yds.×11=55 yds.×$1.65=$90.75
(27)—20′×12=8 8/9=9 strips
27″
25′=8 1/3 yds.×9=75 yds.×$1.75=$131.25
(28)—27′×12=12 strips
27″
22′=7 1/3 yds.×12=88yds.×$2.00=$176.00
(29)— 9′×12=4 strips running lengthwise
27″
12′=4 yds.—(2×¾)=2½ yds.×4=10 yds. strips lengthwise
2 strips 3 yds. long=6 yds. running crosswise
10 yds. plus 6 yds. plus 1½ yds. waste=17½ yds.×$1.20=$21.
(30)—15′=5 yds.=5 strips
18′=6 yds.×5=30 yds. plus 1 yd. waste=31 yds.
(31)—16′×12=7 1/3=8 strips
27″
15′=5 yds.×8=40 yds. plus 1 yd. (8× 1/8)=41 yds.
15′×12=6 2/3=7 strips
27″
16′=5 1/3 yds.×7=37 1/3 yds.+¾ yd. (6×1/8)=38 1/12 yds.
38 1/12×$2.25=$85.69. Lengthwise cheapest by 2 11/12 yds.

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(1)—100′×4′=400 sq. ft.×$.14=$56.00
(2)—150′×5′=750 sq. ft×$.14=$105.00
(3)—240′×3½′=840 sq. ft×$.14=$117.60
(4)—300′×6′=1800 sq. ft.×$.14=$252.00
(5)—500′×4½′=2250 sq. ft×$.14=$315.
(6)—800′×5′=4000 sq. ft.×.14=$560.00
(7)—(50 yds.)150′×3′=450 sq. ft×$.14=$63.00
(8)—(75 yds.)225′×4½′=1012½ sq. ft.×$.14=$141.75
(9)—(90 yds.)270′×5′=1350 sq. ft.×$.14=$189.00
(10)—125′×3′(1 yd.)= 375 sq. ft.×$.14=$52.50
(11)—(200 yds.)600′×5 1/3′=3200 sq. ft.×$.14=$448.00
(12)—350′×8 5/12′=2945 5/6 sq. ft.×$.14=$412.42

(13)—35′×25′=875 sq. ft.×$.21=$183.75
(14)—65′×32′=2080 sq. ft.×$.21=$436.80
(15)—40′×32′=1280 sq. ft.×$.21=$268.00
(16)—84′×45′=3780 sq. ft.×$.21=$793.80
(17)—100′×40′=4000 sq. ft.=444 4/9 sq. yds.×$2.40=$ 1066.67
(18)—150′×32′=4800 sq. ft.=588 1/3 sq. yds.×$2.40=$ 1280.00
(19)—250′×50′=12500 sq. ft.=1388 8/9 sq. yds.×$2.40=$ 3333.33
(20)—100×3′×50′=15000 sq. ft.=1666 2/3 sq. yds.×$2.40=$ 4000.00
(21)—175×3′×60′=31500 sq. ft.=3500 sq. yds.×$2.40=$ 8400.00
(22)—450′×75′=33750 sq. ft.=3750 sq. yds.×$2.40=$ 9000.00
(23)—1000′×50′=50000 sq. ft.=5555 5/9 sq. yds.×$2.40=$ 13333.33
(24)—1500′×60′=90000 sq. ft.=10000 sq. yds.×$2.40=$ 24000.00
(25)—(5280′÷2)×60′=158400 sq. ft.=17600 sq. yds.×$2.40=
($42240.00
(26)—5280′×2×50′=528000 sq. ft.=58666 2/3 sq. yds.×$2.40=
($140800.00
(27)—100′×60′=6000 sq. ft.=666 2/3 sq. yds.×$2.40=$1600.00
(28)—108′×108′=11664 sq. ft.=1296 sq. yds.×$2.40=$3110.40

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(29)—100′×45′=4500 sq. ft.÷9/48 (surface of 1 brick)=24000 brick
24 ×$32=$768.00
(30)—150′×48′=7200 sq. ft.÷9/48=38400 brick
38.4×$32=$1228.00
(31)—200′×60′=12000 sq. ft.÷9/48 sq. ft.=64000 brick
64′×$32=$2048.00
(32)—500′×60′=30000 sq. ft.÷9/48 sq. ft.=160000 brick
160 ×$32=$5120.00
(33)—1200′×50′=60000 sq. ft.÷9/48 sq. ft.=320000 brick
320×$32=$10,240.00
(34)—5280′×75′=396000 sq. ft.÷9/48 sq. ft.=2112000 brick
2112×$32=$67,584.00
(35)—2×5280′×16′=163960 sq. ft.=17773 1/3 sq. yds.×$.90=$16896.
(36)—1 1/2×5280′×20′=158400 sq. ft.=17600 sq. yds.×$.90=$15840.
(37)—4×5280′×18′=380160 sq. ft.=42240 sq. yds.×$.90=$38016.00
(38)—5×5280′×16′=422400 sq. ft.=46933 1/3 sq. yds.×$.90=$42240.
(39)—8×5280′×18′=760320 sq. ft.=84480 sq. yds.×$.90=$76032.00
(40)—10×5280′×16′=844800 sq. ft.=93866 2/3 sq. yds.×$.90=
($84480.00
(41)—42 1/4×31 3/4=1341 7/16 sq. ft.=149 7/144 sq. yds.×$1.44
(=$214.63
(42)—36′×24′=846 sq. ft.=96 sq. yds.
$168÷96=$1.75 cost per yd.
(43)—2×(24 plus 16—2)=76 yds.×1=76 sq. yds.
(44)—2×(75′+135′—10′)=400′×5′=2000 sq. ft. around court
(135′—10′)+(75′—15′)=185′×5=925 sq. ft. cross walks
2000+925=2925 sq. ft.=325 sq. yds.
(45)—160′+75′+5′=240′×5′=1200 sq. ft.×$.24=$288.00

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(1)—16′×4′×4′=256 cu. ft÷128 (1 cord)=2 cords
(2)—12′×4′×4′=192 cu. ft.÷128=1½ cords
(3)—24′×4′×4′=384 cu. ft.÷128=3 cords
(4)—16′×5′×4′=320 cu. ft.÷128=2½ cords
(5)—12′×6′×4′=288 cu. ft.÷128=2 1/4 cords.
(6)—24′×5′×4′=480 cu. ft.÷128=3¾ cords
(7)—30′×4′×4′=480 cu. ft.÷128=3¾ cords

(8)—36′×5′×4′=720 cu. ft.÷128=5⅝ cords
(9)—40′×6′×4′=960 cu. ft.÷128=7½ cords
(10)—62′×5′×4′=1240 cu. ft.÷128=9 11/16 cords
(11)—80′×4′×4′=1280 cu. ft.÷128=10 cords
(12)—72′×8′×4′=2304 cu. ft.÷128=18 cords
(13)—12′×4′×1 1-3′=74 cu. ft.÷128=½ cord
(14)—16′×4′×1 1/3′=85 1/3 cu. ft.÷128=2/3 cord
(15)—18′×6′×1 1/3=144 cu. ft.÷128=1 1/8 cords
(16)—18′×5′×1 1/3′=120 cu. ft.÷128=15/16 cord
(17)—20′×5′×1 1/3′=133 1/3 sq. ft.÷128=1 1/24 cords
(18)—24′×6′×1 1/3′=192 cu. ft.÷128=1½ cords
(19)—36′×4′×1 1/3′=192 cu. ft.÷128=1½ cords
(20)—40′×5′×1 1/3′=266 2/3 cu. ft.÷128=2 1/12 cords
(21)—48′×6′×1 1/3′=384 cu. ft.÷128=3 cords
(22)—80′×5′×1 1/3′=533 1/3 cu. ft.÷128=4 1/6 cords
(23)—100′×6′×1 1/3′=800 cu. ft.÷128=6 1/4 cords
(24)—120′×4′×1 1/3′=640 cu. ft.÷128=5 cords

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(25)—5′×4′×3′=60 cu. ft.×6 (loads)=360 cu. ft.
360÷128=2.0312 cords×$4.50=$9.14
(26)—8′×4′×3′=96 cu. ft.=¾ cord×7=5 1/4 cords

Capacity of bins:
(1)—4′×3′×3′=36 cu. ft.×4/5=28 4/5 bushels
(2)—8′×5′×3′=120 cu. ft.×4/5=96 bushels
(3)—10′×4′×4′=160 cu. ft.×4/5=128 bushels
(4)—12′×6′×5′=360 cu. ft.×4/5=288 bushels
(5)—15′×8′×9′=1060 cu. ft.×4/5=864 bushels
(6)—18′×12′×10′=2160 cu. ft.×4/5=1728 bushels
(5)—5′6″×8′×4′=176 cu. ft.×4/5=140 4/5 bushels
(8)—6′6″×4′6″×3′=87 3/4 cu. ft.× 4/5=70 1/5 bushels
(9)—8′8″×3′6″×4′4″=131 4/9 cu. ft.×4/5=105 7/45 bushels
(10)—10′8″×6′8″×5′4″=378 22/27 cu. ft.×4/5=303 11/27 bushels
(11)—12′8″×6′8″×5′4″=450 10/27 cu. ft.×4/5=360 8/27 bushels
(12)—16′6″×10′ 4″×8′6″=1449 1/4 cu. ft.×4/5=1559 2/5 bushels

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(13)—250×5/4=312½ cu. ft.
(14)—300×5/4=375 cu. ft.
(15)—450×5/4=562½ cu. ft.
(16)—520×5/4=650 cu. ft.
(17)—650×5/4=812½ cu. ft.
(18)—900×5/4=1125 cu. ft.
(19)—1000×5/4=1250 cu. ft.
(20)—1250×5/4=1562½ cu. ft.
(21)—1500×5/4=1875 cu. ft.
(22)—2500×5/4=3125 cu. ft.
(23)—3000×5/4=3750 cu. ft.
(24)—7200×5/4=9000 cu. ft.

(1)—24′×18′×8′=3456 cu. ft.=128 cu. yds.×45c=$57.60
(2)—25′×20′×8′=4000 cu. ft.=148 4/27 cu. yds.×45c=$66.67
(3)—28′×20′×9′=5040 cu. ft.=186 18/27 cu. yds.×45c=$84.00
(4)—30′×25′×9′=6750 cu. ft.=250 cu. yds.×45c=$112.50
(5)—30′×27′×8′=6480 cu. ft.=240 cu. yds.×45c=$108.00
(6)—38′×27′×8′6″=8721 cu. ft.=323 cu. yds.×45c=$145.35
(7)—40′×30′×9′6″=11400 cu. ft.=422 6/27 cu. yds.×45c=$190.00
(8)—45′×32′×19′=27360 cu. ft.=1013 1/3 cu. yds.×45c=$456.00
(9)—45′×25′6″×8′6″=9723¾ cu. ft.=360 15/18 cu. yds.×45c=
($162.56
(10)—48′×24′8″×9′6″=11248 cu. ft.=416 16/27 cu. yds.×45c=
($187.47

(11)—50′×25′6″×9′6″=12112½ cu. ft.=448 33/54 cu. yds.×45c=
($201.88

(12)—64′6″×48′6″×9′=28154 1/4 cu. ft.=1042 81/108 cu. yds.×45c
(=$469.24

(13)—45′×5′×2′=450 cu. ft.=16 2/3 cu. yds×45c=$7.50

(14)—48′×4′×2′=384 cu. ft.=14 2/9 cu. yds.×45c=$6.40

(15)—65′×6′×2′=780 cu. ft.=28 24/27 cu. yds.×45c=$13.00

(16)—75′×4′×3′=900 cu. ft.=33 1/3 cu. yds.×45c=$15.00

(17)—2′×5280′×4′×1′6″=663360 cu. ft.=2346 2/3 cu. yds.×45c=
($1056

(18)—3′×5280′×4′8″×1′6″=110,880 cu. ft.=4106 2/3 cu. yds.×45c=
$1848.00

(19)—5280′×1½′×3′=23760 cu. ft.=880 cu. yds.×45c=$352.00

(20)—Divide cellar into two sections; 20′×8′×4′ and 36′×10′×4′
20′× 8′×4′= 640 cu. ft.
36′×10′×4′=1440 cu. ft.
2080 cu. ft.=77 1/27 cu. yds.×45c=$34.67

(21)—Divide cellar into three sections:
9′×40′×6′=2160 cu. ft.
36′× 8′×6′=1728 cu. ft.
30′× 1′×6′= 180 cu. ft.
4068 cu. ft.=150 2/3 cu. yds.×35c=$52.73

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(1)—30′×12′×1′×22=7920 bricks

(2)—35′×10′×1′×22=7700 bricks

(3)—40′×9′×1½′×22=11880 bricks

(4)—45′×12′×1 1/4′×22=14850 bricks

(5)—50′×16′×1′×22=17600 bricks

(6)—75′×6′×1′×22=9900 bricks

(7)—100′×4′×1′×22=8800 bricks

(8)—120′×5′×1 1/4′×22=16500 bricks

(9)—200′×4′×1′×22=17600 bricks

(10)—200′×4 1/4′×1½′×22=29700 bricks

(11)—60′×7′×6=2520 bricks

(12)—75′×8′×6=3600 bricks

(13)—90′×6′6″×6=3510 bricks

(14)—100′×7′×6=4200 bricks

(15)—125′×8′×6=6000 bricks

(16)—130′×9′×6=7020 bricks

(17)—145′×10′×6=8700 bricks

(18)—150′×10′6″×6=9450 bricks

(19)—40′×34′×8′×22=19947 bricks

(20)—240′×3′×14=10080 bricks

(21)—12′×2′×2′×22=1056×4=4224 bricks
$7.55 plus $8.50=$16.50×4.224=$68.64

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(1)—2×(30′+18′)—(4×1½′)=90′
90′×8′×1½′=1080 cu. ft.=40 cu. yds.×$7.50=$300.00

(2)—2×(36′+20′)—6′=106′
106′×9′×1½′=1431 cu. ft.=53 cu. yds.×$7.50=$397.50

(3)—2×(40′+24′)—6′=122′
122′×8′×1½′=1464 cu. ft.=54 6/27 cu. yds.×$7.50=$406.67

(4)—2×(60′+32′)—6′=178′
178′×9′×1½′=2403 cu. ft.=89 cu. yds.×$7.50=$667.50

(5)—150′×6′×5/6′=750 cu. ft.=27 21/27 cu. yds.×$8.25=$229.17

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(6)—200'×3'×1'=600 cu. ft.=22 6/27 cu. yds.×$9.25=$205.56
(7)—6'×1'×1'×24=144 cu. ft.×72c=$103.68
(8)—12'×2'×1'=24 cu. ft.=24/27 cu. yd.×$16.75=$14.89
(9)—7'×½'×½'×100=175 cu. ft.×45c=$18.75
(10)—240'×5'×1½'=1800 cu. ft.=66 2/3 cu. yds.
(11)—20'+40'+28'+6'+6'+22'+12'+14'=148'
148'—(4×1 1/4')=143'
143'×1 1/4'×4'=715 cu. ft.=26 23/27 cu. yds.×$8.00=$211.84
(For inside corners add thickness of walls.)
(12)—1+2+4=7 parts
1400÷7= 200 cu. ft.=1 part=cement
2×200 = 400 cu. ft. sand
4×200 = 800 cu. ft. stone
1400 cu. ft. total
(13)—2×(48'+28')—6=146'
146'×8'×1 1/4'=1752 cu. ft.÷7 (the cement being 1/7 mixture
(=250 2/7 cu. ft. of cement×$1.30=325.37)

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(1)—40'×5'×1'=200 cu. ft.÷25=8 perch
(2)—75'×6'×1½'=675 cu. ft.÷25=27 perch
(3)—100'×4½'×1½'=750 cu. ft.÷25=30 perch
(4)—225'×5½'×1 1/3'=1650 cu. ft.÷25=66 perch
(5)—240'×3 2/3'×1 1/4'=1100 cu. ft.÷25=44 perch
(6)—400×4 1/3'×1½'=2600 cu. ft.÷25=104 perch
(7)—2×(32'+24')—(4×2')=104'
104'×8'×2'=1664 cu. ft.=67 perch
(8)—2×(45'+24½')—8'=131'
131'×9'×2'=2358 cu. ft.=94 perch
(9)—2×(45'+32')—8'=146'
146'×8½'×2'=2466 cu.. ft.=99 perch
(10)—2×(65½'+32')—8'=187'
187'×9½'×2'=3553 cu. ft.=142 perch
(11)—2×(45'+28½')—8'=139'
139'×8¾'×2'=2434 cu. ft.=97 perch
(12)—2×(54½'+28 2/3')—8'=158 1/3'
158 1/3'×9¾'×2=2929 1/6 cu. ft.=117 perch
(13)—2×(24'+10')—4'=64'
64'×4'×1'=256 cu. ft.÷24¾=10.343 perch
(14)—11×$1.90=$20.90

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(1)—5 W. S. Stamps @ $4.17=5×$4.17=$20.85.
(2)—24 W. S. Stamps @ $4.18=24×$4.18=$100.32
(3)—20 W. S. Stamps @ $4.20=20×$4.20=$84.00
(4)—75 W. S. Stamps @ $4.22=75×$4.22=$316.50
(5)—20 W. S. Stamps @ $4.18=20×$4.18=$83.60
$100 redemption of 1 certificate
83.60 cost

$ 16.40 profit
∴the profit will be $16.40.

(6)—20 W. S. S. @ $4.19=$83.80
20 W. S. S. @ $4.21= 84.20
20 W. S. S. @ $4.23= 84.60
$252.60
$300.00 redemption of 3 W. S. S. Certificates
252.60 cost
$ 47.40 profit
∴ he will make a profit of $47.40.

(7)—15×$1=$15
24×$2=$48
$63 total earnings
$63÷$4.20=15 no. of stamps or 3/4 of a W. S. Certificate
$75 redemption on 15 W. S. S. or 3/4 Certificate
63 cost
$12 profit.
∴ he will make a profit of $12.00.

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I. The Business Man's Use of Analysis.

(1)—If 8 equals cost of 1 overcoat and $2.50 equals gain on 1 overcoat then $10.50 equals money received for 1 overcoat—for 60 overcoats money received equals 60×$10.50 equals $630.

(2)—If a 100 lb. bag of salt is divided into 10 lb bags the grocer has as many 10 lb. bags as 10 is contained times in 100 equals 10 times. ∴ 10=10 lb. bags of salt. If 1 bag sells for 12c, 10 bags will sell for 10×12c equals $1.20. If the salt cost $.75 his gain equals $1.20—$.75 equals $.45.

(3)—Question: What part of 48 yds. is 16 yds.?
It is 16/48 equals 1/3. ∴ The dealer sold 1/3 of the bolt.

(4)—If $1.45 equals S. P. per yd. for dress goods
and 1.20 equals cost per yd. for dress goods
$ .25 equals gain per yd. for dress goods
In order to gain $10 the merchant must sell as many yards of dress goods as .25 is contained times in 10 equals 40 times.
∴ he must sell 40 yards.

(5)—If a grocer pays 55c per doz. for eggs for 10 doz. he will pay 10×55c equals $5.50. At 6 1/5c per yd. he will give as many yards in payment as .0625 is contained times in $5.50 equals 88 times. ∴ 88 yards are given. Work below

88
.0625/ 5.50 equals 625/55000
5000
5000

(6)—Cost of 1 T. of coal equals $4.25
Freight on 1 T. of coal equals .42
$4.67
Cost to dealer of 50 T. of coal equals 50×$4.67 equals $233.50.

(7)—If 3/4 yd. of silk cost $2.25 equals $.75
1/4 yd. of silk cost 1/3 of $2.25 equals $.75
4/4 yd. of silk or 1 yd. of silk will cost 2 1/4×3 equals $6.75.

(8)—If a piano dealer offers $450 in installments for a piano that is priced at $400 cash the amount added for the installment plan equaled $450—$400 equals $50.

Question: What part of $400 is $50? It is 50/400 equals 1/8.
∴ 1/8 equals fractional part of cash offer added.

(9)—If 1 payment equals $1.25 on a sewing machine
24 payments equal 24×$1.25 equals $30 equals price of machine. If the profit equals $10, the machine cost the dealer $30—$10 equals $20.

(10)—If a shoe dealer sells 45 pr. of slippers at $45 which was 3/4 of the regular price 1/4 of the regular price equals 1/3 of $45 equals $15
4/4 of the regular price equals 4×$15 equals $60.
∴ Regular price equals $60.

(11)—Last year's profits to a merchant equal 5/5 of his profits.
If this year's profits equal 1/5 more then this year's profits equal 6/5 of his profits. $2160 equals the merchants profits which is 6/5 of last year's profits.
If $2160 equals 6/5 of last year's profits
1/5 of last year's profits equals 1/6 of $2160 equals $360.
5/5 of last year's profits equals 5×$360 equals $1800.
∴ Last year's profits equals $1800.

(12)—If a butcher sold 2½ lbs. ham to one woman and ½ as much to another, amount sold to second woman equals ½ of 2½ lbs. ham plus 1 1/4 lbs ham equals 3¾ lbs. ham. He had left 16¾ lbs.—3¾ lbs.=13¾ lbs.

(13)—In $12500 there are 125 one hundred dollars.
If rate of insurance equals 6c on $100 on $12500 it will be 125×6c equals $7.50.

(14)—In 3 sales of 5½ yds., 8 yds., and 12¾ yds., the no. of yards sold equals 5½ yds. plus 8 yds. plus 12¾ yds. equals 26 1/4 yds. If the bolt contained 40 yds. the no. yds. left equals 40 yds.—26¼ yds. equals 13¾ yds.
At 24c per yd. it is worth 13¾×24c equals $3.30.

(15)—If a dealer sold 1 doz lemons at 25c for 40 doz. he will receive 40×25c equals $10. If he paid $6 for them his gain equals $10—$6 equals $4.

(16)—If 1 canful of gasoline equals 5 gal. 38 canfuls equals 38×5 gals. equals 190 gal. At 14c per gal. the gasoline was worth 190×14c equals $26.60.

(17)—If 196 lbs. of flour is divided into 8 equal sacks, each sack contains as many lbs. as 8 is contained times in 196 equals 24½ times. Therefore 24½ lbs. of flour @ 7c per lb. will sell for 24½×7c equals $1.71½=price per sack.
8 sacks will sell for 8×$1.71½ equals $13.72.
If the flour cost $10.76, dealer's profit equals $13.72—$10.76 equals $2.96.

(18)—If one case of cereal contains 2 doz. packages 25 cases will contain 25×2 doz. equals 50 doz. At $1 per doz. 50 doz. will cost 50×$1 equals $50.
If 1/5 of the cereal is spoiled, amount spoiled equals 1/5 of 50 doz. equals 10 doz. The grocer had left to sell 50 doz.—10 doz. equals 480 boxes. At 15c per box he receives 480× 15c equals $72. He gains $72—$50 equals $22.

(19)—600 long T. of coal at $4 a T costs 600×$4 equals $2400.
In 600 long T there are 600×2240 lb. equals 1344000 lbs.
There are as many short T as 2000 is contained times in 1344000 equals 672 times. ∴ 672 short T.

At $4.50 per short T the dealer receives 672×$4.50 equals $3024.
His net profit equals $3024—$2400 equals $624.

(20)—If 1 boy owns 3 times as large a share as another boy, they both own 4 times as large a share which equals 5/12 of the Motor Boat. If 4 times the share equals 5/12, 1 times the share equals 1/4 of 5/12, equals 5/48 equals 1 boy's share. The other boy owns 3 times as much which equals 3×5/48 equals 15/48 or 5/16.
∴ 1st boy owns 5/48, 2nd boy 5/16.

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(21)—If 2/3 of a yd. of silk cost $1.00
1/3 of a yd. of silk cost ½ of $1.00 equals $.50
3/3 of a yd. of silk or a yd. costs 3×$.50 equals $1.50.

(22)—At 45c per yd. 10 yd. of cloth would be worth 10×45c equals $4.50. At $2.25 per doz. a woman would receive as many doz. handkerchiefs as $2.25 is contained times in $4.50 equals 2 times. ∴ 2 doz. equals 2×12 handkerchiefs, equals 24 handkerchiefs received.

(23)—If 1½ lb. of ham costs 48c 1 lb. will cost as much as 1½ is contained times in $.48 equals .32 times. ∴ 1 lb. costs 32c.

(24)—At 55c per doz. 8 doz. eggs are worth 8×55c equals $4.40. At 9c a lb. a woman should receive as many lbs. of sugar in exchange as $.09 is contained times in $4.40 equals 48 8/9

(25)—At $5 per T 8 T of coal cost 8×$5 equals $40.
52 weeks equals 1 year. If a woman used $40 worth of coal in a year in 1 wk. the coal will cost as much as 52 is contained times in 40 equals $.76 8/9 times.
∴77c equals cost for 1 wk.

(26)—If 2/3 yd. carpet covers 1 stair, to cover 15 stairs it will take 15 ×2/3 yd. carpet, equals 10 yd. carpet. At $1.75 per yd. the carpet will cost 10×$1.75 equals $17.50.

(27)—If 24 lbs. equals 1/2 the weight of fruit used in canning, 2/2 the weight of fruit used in canning equals 2×24 lbs. equals 48 lbs.
At 8c per lb. the fruit will cost 48×8c equals $3.84.

(28)—At 9½c per lb. the sugar in above problem will cost 24×9½c equals $2.28. Total cost of canning will be $3.84 plus $2.28 equals $6.12.
If the fruit fills 40 cans each can costs as much as 40 is contained times in $6.12 equals $.15 3/10 times.
∴ 15 3/10 equals cost of each can.

(29)—In 28 wks. @ $1.00 per wk. a housewife would pay 28×$1= $28.00. By paying cash she could have saved $28—23.50 equals $4.50.

(30)—At 14c per qt. 2 qt. of milk will cost 2×14c equals $28c. If 28c is spent for milk and 9c for cream in a day, total amount spent equals 28c plus 9c equals 37c. In 30 days amount spent for cream and milk equals 30×37c equals $11.10.

(31)—If a wife is allowed $16 for expenses and 1/4 of this is paid to the maid amount paid to the maid equals 1/4 of $16 equals $4. If $7.25 is paid for groceries and $4 to the maid—amount expended equals $7.25 plus $4 equals $11.25
Amount left for meat and milk equals $16—$11.25 equals $4.75.

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(32)—At 30c per doz. 4½ doz. eggs cost 4½×30c equals $1.35
At 80c a bu. ½ bu. potatoes costs ½ of $.80 equals .40
At 30c a pk. ½ pk. apples costs ½ of 30c equals .15

Total cost of articles bought equals $1.90
The housekeeper should have $2—$1.90 equals 10c from $2 bill.

(33)—If a widow spends $25 per mo. for food in 1 yr. she spends
12×$25 equals $300 a yr. for food
she spends 50 a year for clothing
and she saves 160 a yr.

Total amount $510 a yr. which is 3/4 of her income
If $510 equals 3/4 of her income
1/4 of her income equals 1/3 of $510 equals $170
4/4 of her income or all income equals 4×$170
equals $680. (1/4 of her income was spent for rent.)

(34)—At $ 7 per T. 9 T. of coal will cost 9×$7 equals $ 63 for 1 yr.
At $18 per mo. rent will be 12×$18 equals 216 for 1 yr.

Total cost equals $279
At $24 per mo. rent will be 12×$24 equals $288 for 1 yr.
It is cheaper by $288—$279 equals $9 to rent the house.

(35)—Two rooms at $2.25 each rent for 2×$2.25 equals $4.50 wk.
Two rooms at $2 each rent for 2×$2 equals 4.00 wk.
One room at $1.75 rents for $1.75 wk.

Total rent for rooms equals $10.25 wk.
Total rent for 1 yr. equals 52×$10.25 equals $533.
Annual expenses of running the house equals $65.40 plus $54 plus $20 plus $100 equals $239.40. Profit equals $533—$239.40 equals $293.60.

(36)—If 1 qt. of milk weighs 2.2 lb. in 125 lbs. of milk there are as many quarts as 2.2 is contained times in 125 equals 56.8 times.
∴ 56.8 qt. milk.

(37)—If 11 head of cattle equals 5 more than 1/4 of the herd
11 cattle—5 cattle or 6 cattle equals 1/4 of the herd
4/4 of the herd or all the cattle equals 4×6 cattle equals 24 cattle.

(38)—If 3/5 of an A. produces 90 bu. of potatoes
1/5 of an A. produces 1/3 of 90 bu. equals 30 bu.
5/5 of an A. produces 5×30 bu. equals 150 bu. potatoes
6 A. will produce 6×150 bu. potatoes equals 900 bu. potatoes.

(39)—If a farmer sold 3/5 of a pasture he must have retained 5/5 of pasture—3/5 of a pasture equals 2/5 of the pasture which is 10 A. If 10 A. equals 2/5 of a pasture 1/5 of pasture equals ½ of 10 A. equals 5 A., 5/5 of pasture or original pasture equals 5/5 A. equals 25 A.

(40)—3/3 of a crop of grain equals all the crop
2/3 of a crop of grain equals amount sold at $30
∴ 1/3 of a crop of grain equals 50 bu. amount sold at $30.
1 bu. sold for as much as 50 in contained times in 30 equals .60. ∴ 1 bu. sold for 60c equals 2nd price per bu. 2/3 of the crop equals 2×50 bu. equals 100 bu. sold for $50. 1 bu. sold for as much as 10 0is contained times in 50 equals .50 times.
∴ 50c per bu. equals 1st price per bu.

(41)—At $60 an A. for 80 A. of land the price equals 80×$60 equals $4800. If 80 A equals 4/5 of the farm 1/5 of the farm equal 1/4 of 80 A. equals 20 A.
If the farmer was offered $2000 for 20 A. and $4800 for 80 A. the total offer equals $4800 plus $2000 equals $6800. If $200 equals offer for 20 A. for 1 A. it is as much as 20 is containe times in $2000 equals 100 times. ∴ $100 per A. for 1/5 of land

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(42)—If a farmer mixes concrete 1 part cement, 2 parts sand and parts gravel, and he uses 1 bbl. cement, 2 bbl. sand he wil need 4 bbl. gravel.

(43)—The "1-2-4" mixture equals 1 part plus 2 parts plus 7 part in all.
∴ he uses 1/7 of the total of 700 cu. ft. equals 100 cu. ft. cemen
he uses 2/7 of the total of 700 cu. ft. equals 400 cu. ft. sand
he uses 4/7 of the total of 700 cu. ft. equals 400 cu. ft. grave

(44)—If a laborer earns $1.25 a day and spends $.50 a day amount h saves in a day equals $1.25—$.50 equals $.75 a day. To sav $45 he will have to work as many days as .75 is contained i 45 equals 60 times. ∴ 60 days.

(45)—If a farmer has 720 bu. of wheat and 2/3 of this equals the 3/ of no. of bu. corn he has then 2/3 of 720 bu. of wheat equal 480 bu. of wheat which is ¾ of no. bu. of corn.
If 480 bu. equals 3/4 of his corn to be bought
1/4 of his corn to be bought equals
1/3 of 480 bu. equals 4/4 of his corn to be bought equals
4×160 bu. equals 640 bu. of corn to be bought.
At 60c per bu. the corn will cost 640×60c equals $384.

(46)—

Cost of mowing machine equals	$ 45.50
Cost of rake equals	32.00
Cost of wagon equals	87.00
Total cost	$164.50

To pay for this with wheat at $1.75 a bu. it will take as man bu. of wheat as $1.75 is contained times in $164.50 equals 9 times. ∴ 94 bu. of wheat must be given.

(47)—If 280 cu. ft. of concrete is required for the foundation of a sil
the amount of cement used equals 1/7 of 280 cu. ft. equals 4 cu. ft.
the amount of sand used equals 2/7 of 280 cu. ft. equals cu. ft.
the amount of gravel used equals 4/7 of 280 cu. ft. equals 1 cu. ft.

(48)—If 1 bbl. contains 2½ bu. of apples 110 bbl. contain 110×2 bu. equals 275 bu. If 1 bu contains 4 pk., 175 bu. contain 2 ×4 pk. equals 1100 pk. If these apples are placed in ½ p baskeets it will take 2200 baskets which cost 2200×3c equa $66.00 for baskets. If he retails each basket at 20c he receiv 2200×20c equals $440. If the cost of the baskets equals $ he saves $440—$66 equals $374.
At $2.50 a bbl. he would have received 110×$2.50 equals $27
∴ he receives $374-–$275 equals $99 more for apples by r tailing them.
(The book has an error: $20 per basket should be 20c.)

(49)—60 lb. equals 1 bu. 2000 lb. equals 1 T.
In 2400 bu. there are 2400×60 lb. equals 144000 lb.
If 2000 lb. equals 1 T. in 144000 lb. there are as many T.

2000 is contained times in 144000 equals 72 times. ∴ 72 T. of potatoes are delivered.

If the farmer takes 2 T. to the load it wil ltake him 36 trips to deliver the potatoes. If each roun dtrip is 5 mi. 36 round trips equals 36×5 mi. equals 180 mi. If the car uses 1 gal. of gasoline to 8 mi. in going 180 mi. it will use as many gal. of gasoline as 8 is contained times in 180 equals 22½ times.

∴ 22½ gal. of gasoline are used. At 22c a gal. it will cost 22½ ×22c equals $4.95. At 75c a trip for labor the labor will cost 36×$.75 equals $27.00. Total cost of delivery equals $4.95 plus $27.00 equals $31.95.

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(1)—
$$\begin{array}{rcl} x \div 5 &=& 9\\ -5 &=& -5\\ \hline x &=& 4 \end{array}$$

(2)—
$$\begin{array}{rcl} x \div 6 &=& 9\\ -6 &=& -6\\ \hline x &=& 3 \end{array}$$

(3)—
$$\begin{array}{rcl} x \div 8 &=& 9\\ -8 &=& -8\\ \hline x &=& 4 \end{array}$$

(4)—
$$\begin{array}{rcl} x \div 2 &=& 6\\ -2 &=& -2\\ \hline x &=& -2 \end{array}$$

5)—
$$\begin{array}{rcl} x \div 7 &=& 8\\ -4 &=& 4\\ \hline x &=& 4 \end{array}$$

)—
$$\begin{array}{rcl} x - 8 &=& 9\\ +8 &=& +8\\ \hline x &=& 17 \end{array}$$

10)—
$$\begin{array}{rcl} 2x &=& 10\\ x &=& 5\\ \hline \end{array}$$

11)—
$$\begin{array}{rcl} 2x &=& 16\\ x &=& 8\\ \hline \end{array}$$

12)—
$$\begin{array}{rcl} 3x &=& 15\\ x &=& 5\\ \hline \end{array}$$

(13)—
$$\begin{array}{rcl} 4x &=& 24\\ x &=& 6\\ \hline \end{array}$$

(17)—
$$\begin{array}{rcl} 4x &=& 7\\ x &=& 4/7\\ \hline \end{array}$$

(18)—
$$\begin{array}{rcl} 5x &=& 11\\ x &=& 11/5\\ \hline \end{array}$$

(19)—
$$\begin{array}{rcl} 2x + 3 &=& 9\\ -3 &=& -3\\ 2x &=& 6\\ x &=& -3\\ \hline \end{array}$$

(20)—
$$\begin{array}{rcl} 3x + 2 &=& 8\\ -2 &=& -8\\ \hline 3x &=& 6\\ x &=& 2 \end{array}$$

(21)—
$$\begin{array}{rcl} 5x + 1 &=& 16\\ -1 &=& -1\\ \hline 5x &=& 15\\ x &=& 3 \end{array}$$

(25)—
$$\begin{array}{rcl} 7x - 3 &=& 19\\ +3 &=& +3\\ \hline 7x &=& 22\\ x &=& 22/7 \end{array}$$

(26)—
$$\begin{array}{rcl} 5x + 4 &=& 21\\ -4 &=& -4\\ \hline 5x &=& 17\\ x &=& 17/5 \end{array}$$

(27)—
$$\begin{array}{rcl} 8x + 1 &=& 25\\ x - 1 &=& 1\\ \hline 8x &=& 24\\ x &=& 3 \end{array}$$

(28)—
$$\begin{array}{rcl} 9x - 2 &=& 30\\ x + 2 &=& 2\\ \hline 9x &=& 32\\ x &=& 32/9 \end{array}$$

PAGE 53

(1)

$x=$ unknown number
$7x=$ seven times that unknown number
$112=$ seven times that unknown number
$7x=112$
$x=16.$

(2)

$x=$ unknown number
$9x=$ nine times that unknown number
$144=$ nine times that unknown number
$9x=144$
$x=16$

(3)

$x=$ unknown number
$13x=156\div 13=$ unknown number
$13x=156$
$x=12$

(4)

$x=$ unknown number
$7x=\$175\div 7x=$ the unknown num ber
$7x=\$175$
$x=\$25.$

(5)

$x=$ unknown number
$45=1350\div 45x=$ the unknow number
$45x=1350$
$x=30$ cars

(6)

$x=$ unknown number
$12x=\$216\div 12=$ unknown numbe
$12x=\$216$
$x=\$18$

(7)

$x=$ unknown number
$16x=5280$ ft. in one mile
$16x=5280\div 16$
$x=330$ ft.

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(8)

$$\begin{array}{rcr} x+25 & = & 110 \\ -25 & = & -25 \\ \hline x & = & 85 \end{array}$$

(9)

$$\begin{array}{rcr} x+37 & = & 145 \\ -37 & = & -37 \\ \hline x & = & 108 \end{array}$$

(10)

$$\begin{array}{rcr} x-21 & = & 93 \\ +21 & = & +21 \\ \hline x & = & 114 \end{array}$$

(11)

$$\begin{array}{rcr} x-34 & = & 115 \\ +34 & = & +34 \\ \hline x & = & 149 \end{array}$$

(12)

$$\begin{array}{rcr} x+45 & = & \$.88 \\ -45 & = & -45 \\ \hline x & = & .43 \end{array}$$

(13)

$$\begin{array}{rcr} x+62 & = & 98c \\ -62 & = & -62c \\ \hline x & = & 36c \end{array}$$

(14)

$$\begin{array}{rcr} x+150 & = & \$1000 \\ -150 & = & -150 \\ x & = & \$875 \\ \hline & & 850 \end{array}$$

(15)

$$\begin{array}{rcr} x+60 & = & 145 \\ -60 & = & -60 \\ \hline x & = & 85 \end{array}$$

(16)

$$\begin{array}{rcr} 2x+34 & = & 66 \\ -34 & = & -34 \\ \hline 2x & = & 32 \\ x & = & 16 \end{array}$$

(17)

$$\begin{array}{rcr} x+90 & = & 235 \\ -90 & = & -90 \\ \hline x & = & 145 \end{array}$$

(18)

$$\begin{array}{rcr} 2x+24 & = & 136 \\ -24 & = & -24 \\ \hline 2x & = & 112 \\ x & = & \$56 \\ & & \$80 \end{array}$$

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(19)

$x=$ smaller no.
$3x=$ larger no.
their sum$=100$
therefore $4x=100$
$x=25$ smaller no.
$3x=75$ larger no.

(20)

$x=$ smaller no.
$5x=$ larger no.
their sum$=60$
therefore $6x=60$
$x=10$ smaller no.
$5x=50$ larger no.

(21)

x=girl's age
3x=boy's age
their sum=24
therefore 4x=24
x= 6
3x=18

(22)

x=boy's age
3x=man's age
their sum=48
therefore 4x=48
x=12 boy's age
3x=36 man's age

(23)

x=boy's weight
3x=father's weight
their sum = 240 lbs.
therefore 4x=240
x=60 boy's weight
3x=180 man's weight

(24)

x=no. of one boy's work
2x=no. of the other boy's work
their sum=60
therefore 3x=60
x=20
2x=40

(25)

=boy's
4x=man's
their sum=$15
therefore 5x=15
x=$3 boy's
4x=$12 man's

(26)

x=cost of wagon
4x=cost of horse
their sum=$250
therefore 5x=$250
x=$50 wagon
4x=$200 horse

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(27)

x=the smaller no. lot
5x=the larger no. house
6x or (x+5x=6x)=
$3,000 the sum
6x=$3,000
x= 500 lot
x= 2,500 house

(28)

x+10 = 25
—10 = —10
3x = 15
x = 5

(29)

x+5 = 80
—5 = —5
5x = 75
x = 15

(30)

4x—10 = 50
+10 = +10
4x = 60
x = 15

(31)

7x—11 = 59
+11 = +11
7x = 70
x = 10

(32)

3x+5x = 56
8x = 56
x = 7

(33)

7x—4x = 36
3x = 36
x = 12

(34)

x=smaller no.
4x=larger no.
their sum=50
therefore 5x=50
x=10
4x=40

(35)

x=cost of the sled
$1=whole cost
$7—1=$6=2x
$6÷2x=$3
2x=$6
x=$3

(36)

10+30 = 80
—30 = —30
10x = 50
x = 5 boys

(37)

$100=$10 the debt=$90 left
5x×the debt=$50
x+50= 90
—50=—50
x= $40 keep out

(38)

x = price of a chair
7x = all
their sum = 35
7x = 35
x = 5

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(39)

$4800=all
x=lot
3x=house
4x=$4800
x= 1200

(40)

x=1st boy's—Harry's
+15=2d boy's—Tom's
+25=3d boy's—Jack's
3x=40
3x+40=100
—40=—40
3x=60
x=20
x=20c—Harry's
x+15=35c—Tom's
x+25=45c—Jack's

(41)

x=Jerry's weight
3x+20=father's weight
4x+20=250
—20=—20
4x =230
x= 57½ Jerry's weight
57½×3+20=father's weight
192½=father's weight

(42)

x=Kate's
3x=Emily's
9x=Mary's
13x=52 all
x=4=Kate's
4×3=12=Emily's
3×12=36=Mary's

(43)

2x+8= 28
—8=—8
2x = 20
x=$10 Earl
2x—8= 28
+8=+8
2x = 36
x= 18 Dick

(44)

x=weight of truck
2x=weight of coal
3x=weight of all
3x=7,350
x=2,450=truck
twice the truck=coal
2,450×2=4,900=coal

(45)

x=how far by boat
3x=how far by rail
4x=all=160 miles he traveled
x=40 miles by boat
3x=120 miles by rail

(46)

x=repairs
6x=gasoline
7x=all of $175
x=$25 repairs
6x=$150 for gasoline

(47)

x=rent
2x=food
x=maid and clothing
4x=$2000
x=$500 rent annually
2x×rent=$1000=food annually

(48)

x=girl's age
2x=boy's age
6x=man's age
9x=all=54 their ages
x=6=girl's age
2×6=12=boy's age
6×6=36=man's age

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(1)—.05×80=4 .08×70=5.6 .10×45=4.5 .15×75=11.25
(2)—.06×80=4 .08×95=7.6 .10×110=1.1 .16×120=19.2
(3)—.06×90=5.4 .09×109=9.81 .12×125=15 .20×135=27
(4)—.07×90=63 .10×130=13 .14×150=21
(5)—.15×$275=$41.25
(6)—.15×$300=$45
(7)—.18×$320=$57.60
(8)—.20×$340=$68
(9)—.25×$120.50=$31.38
(10)—.28×$325.75=$91.21
(11)—.30×$610.50=$183.15
(12)—.35×$670.75=$234.76
(13)—.40×$1250=$500
(14)—.60×$1500=$900
(15)—.75×$2150=$1612.50
(16)—.80×$3750=$3000
(17)—.10×$1000=$100 .20×$1000=$200 .40×$1000=$400 .80×$1000=$800
(18)—.125×$1500=$187.50 .25×$1500=$375 .50×$1500=$750 .375×$1500=$562.5
(19)—.33 1/3×$2400=$800 .66 2/3×$2400=$1600 .87 1/3×$2400=$2096
(20)—.0625×$2400=$150 .08 1/3×$2400=$200 .16 2/3×$2400=$400 .83 1/3×$2400=$2000
(21)—1.10×$500=$550 1.25×$500=$625 1.50×$600=$900
(22)—.10×.25×$200=$5 .25×.40×$2500=$250
(23)—.005×20=.1
(24)—.005×30=.15
(25)—.0025×20=.05
(26)—.003 1/3×30=.1
(27)—.001×100=.1
(28)—.003×300=.9
(29)—.00375×1200=4.5
(30)—.00625×400=2.5
(31)—.008×200=1.6
(32)—.0075×200=1.5
(33)—.006 2/3×600=4
(34)—.004 4/9×900=4
(1)—.05×120 boys=6 boys
(2)—.08×$5000=$400
(3)—$500—(.125×$500=$62.50)=$437.50
(4)—.08×$9500=$760

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(5)—.125×$9=$1.125
(6)—.15×$24,000=$3600
(7)—$20—(.20×$20=$4)=$24
(8)—.85×1200 gal.=1020 gal.
(9—.33 1/3×540=180 no. men
.50×540=270=no. women
540—(180+270=450)=90 children
(10)—.125×$7000=$875
.15×$7000=$1050
(2×$875=$1750)—$1050=$2700

(11)—$800×.10=$80, $800+$80=$880, $880×.10=$88, $880+$88=$968, $968×.10=$96.80, $968+$96.80=$1064.80 $1064.80×.10=$106.48, $1064.80+$106.48=$1171.28, $800+$880+$968+$1064.80+$1171.28=$4884.08

(12)—.15×$54000=$8,100=Real Estate
.33 1/3×$54000=$18,000=Bonds
.40×$54000=$21600=Business
$8000+$18000+$21,600=$47,700. $54000—$47,700=$6,300

(13)—.04×$3000=$120, .05×$3000=$150, .01×$3000=$30, .06×$3000=$180, $120+$150+$30+$180=$480

(14)—.25+.35+.18+.07+.05=.90, $1.00—.90=.10 saved, $450÷10=$45, 100×$45=$4500

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(1)—$6.00÷30=.20 10.00÷30=.33 10.00÷40=.25 12.00÷60=.20

(2)—5.00÷40=.125 8.00÷40=.20 20.00÷40=.50 15.00÷75=.2

(3)—10.00÷50=.20 20.00÷75=.24 32.00÷80=.40 50.00÷90=.55 5/9

(4)—50.00÷125=.40 75.00÷125=.60 100.00÷125=.80 125.00÷125=1.00

(5)—8.00÷128=.06 1/4 13.00÷156=.08 1/3 12.50÷250=.05 175.00÷350=.50

(6)—30.00÷150=.20 36.00÷180=.20 40.00÷200=.20 48.00÷240=.20

(7)—75.00÷225=.60 16.00÷256=.06 1/4 81.00÷324=.25 5.20÷520=.01

(8)—12.5÷250=.05 7.50÷375=.02 84.00÷4200=.02 8.40÷4200=.002

(9)—120.00÷300=.40 180÷300=.60 225÷300=.75 1350÷4500=.30

(10)—13÷27=48.1% 14÷35=40% 12÷42=28.5% 16÷54=29.6%

(11)—15÷35=42.8% 19÷46=41.3% 19÷54=35.1% 25÷54=46.2%

(12)—18÷64=28.1% 24÷69=34.7% 19÷74=25.6% 40÷82=48.7%

(13)—21÷92=22.8% 29÷95=30.5% 37÷110=33.6% 44÷120=36.6%

(14)—31÷110=28.1% 35÷120=29.1% 53÷145=36.5% 56÷160=35%

(15)—$11÷$25=44% $32÷$75=42.6% $17÷$90=18.8% $19÷$100=19%

(16)—$11.35÷$35.50=31.9% $13.25÷$47.10=28.1% $1175÷$54.65=21.5%

(17)—8.19÷$125.50=6.5% $111.25÷$256.75=43.3% $125÷$1,565.50=7.9%

(1)—75.00÷125=.6=60%

(2)—100.00÷120=.83 1/3=83 1/3%

(3)—$300.00÷$1500=.2=20%

(4)—100—80=20 increase; 20÷80=1/4=25%

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(5)—$200—$160=$40 gain $40.00÷160=.25=25%

(6)—40.0÷200=.2=20%

(7)—42—14=28 won 28.00÷.42=.75=75%

(8)—5.00÷30=.85 5/7=85.5%

(9)—$600.00÷$3600=.16 2/3=16 2/3%
(10)—200.00÷1400=.14 2/7=14 2/7%
Note: "pounds" should read 'cubic feet."
(11)—$8000×.65=$5200 house; $8000—$5200=$2800 lot
(12)—642.0000÷642=.0394=3.94%
(13)—$250000÷$150000=1.66 2/3=166 2/3%
(14)—$1750.00÷$35000=.05=5%
(15)—$2437.50÷$3750=.65=65% 65% is 65c on $1
(16)—$7500+$1800+$1200=$10500; $15000—$10500=$4,500 net profit. $4500÷$15000=.3 or 30%

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(17)—1200×.70=840 mi. by water, 1200—840=360 mi. by rail
(18)—5/12=.41 2/3=41 2/3%, 3/12=.25=25%, 7/12=58 1/3—.58 1/3%, 11/12=.91 2/3=91 2/3%
(19)—$80000.00÷$120,000=.66 2/3=66 2/3%
(20)—1200—(4000+600+1000)=200. 200.00÷1200=.16 2/3=16 2/3%
600.00÷1200=.5=50%; 400.00÷1200=.33 1/3=33 1/3%
(21)—$1500.00÷$6000=.25=25%; $1500+$6000=$7500; $6000.00÷$7500=.8=80%
(22)—$120000÷$10000=12; 12×$100=$1200; $2000+$1200=$3200; $1200.00÷$2000=.6=60%
(23)—$180+$75+$20=$275; $275.0000÷$6000=.0458 1/3=4.58 1/3%
(24)—24+10=34; 24.0000÷34=.7058=70.58%; 25+11=36; 25.0000÷36=.6944=69.44%; 20+13=33; 20.000÷33=.606=60.6%; 26+8=34; 26.0000÷34=.7647=76.47%

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(1)—25%=1/4=50 4/4=4×50=200, 50%=1/2=75, 2/2=2×75=150, 50%=1/2=125, 2/2=2×125=250, 60%=3/5=150, 5/5=250

(2)—20%=1/5=60, 5/5=5×60=300, 40%=2/5=80, 5/5=200, 60%=3/5=100, 5/5=166 2/3, 90%=9/10=180, 10/10=200

(3)—30%=3/10=60, 10/10=200, 50%=1/2=80, 2/2=2×80=160, 50% 1/2=140, 2/2=2×140=280, 60%=3/5=210, 5/5=350

(4)—50%=1/2=75, 2/2=2×75=150, 33 1/3%=1/3=100, 3/3=3×100=300, 60%=3/5=180, 5/5=300, 62 1/2%=5/8=240, 8/8=384

(5)—60%=3/5=75, 5/5=125, 75%=3/4=90, 4/4=120, 80%=4/5=144, 5/5=180, 62 1/2%=5/8=180, 8/8=288

(6)—12 1/2%=1/8=50, 8/8=8×50=140, 33 1/3%=1/3=75 3/3=3×75=225, 62 1/2%=5/8=125, 8/8=200, 125%=5/4=200, 4/4=160

(7)—37 1/2%=3/8=75, 8/8=200 62 1/2%=5/8=100, 8/8=160, 90%=9/10=100, 10/10=200, 105%=21/20=210, 20/20=200,

(8)—40%=2/5=90, 5/5=225, 60%=3/5=120, 5/5=200, 80%=4/5=240, 5/5=300, 120%=6/5=250, 5/5=208 1/3

(9)—100%=5/5=120, 60%=3/5=125, 5/5=208 1/3
95%=19/20=190, 20/20=200, 200%=4/2=250, 2/2=125

(10)—150%=3/2=120; 2/2=80; 67 1/2%=135; 1%=2. 100%=100×2=200; 100%=5/5=175; 200%=4/2=275; 2/2=137 1/2

(11)—100%=5/5=200; 112 1/2%=9/8=225; 8/8=200; 125%=5/4=250; 4/4=200; 200%=4/2 350; 2/2=175

(1)—12=.20× ; 12.00÷.20=60
(2)—15=.12× ; 15.00÷.12=125
(3)—$500=.125× ; $500÷.125=$4000

(4)—1.00—.85=.15 finished; .45=15×?; 45.00÷.15=300
(5)—1.00—.33 1/3=.66 2/3 full; 12=.66 2/3×?; 12.00÷.66 2/3=18.
(6)—420=.30×?; 420.00÷.30=1400; 1400—420=980
(7)—$200=1.20×?; $200.00÷1.20=$166.66 2/3; $200.00—$166.66 2/3 =$33.33 1/3; 1.20—1.00=.20=20%

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(8)—$960=.625×?; $960.000÷.625=$1536; 1.00—.625=.365 or 36.5%
(9)—48=.37 1/2×?; 48.000÷.375=128; 128—48=80
(10)—$7500=.83 1/3×?; $7500.0000÷.8333 1/3=$9000; $9000—$7500=$1500

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(1)—25×.06¼=1.56
(2)—35×.06¼=2.18
(3)—45×.06¼=2.81
(4)—55×.06¼=3.43
(5)—65×.06¼=4.06
(6)—75×.06¼=4.68
(7)—50×.08⅓=4.17
(8)—75×.08⅓=6.25
(9)—90×.08⅓=7.50
(10)—105×.08⅓=8.75
(11)—115×.08⅓=9.58
(12)—125×.08⅓=10.42
(13)—75×.12½=9.38
(14)—90×12½=11.25
(15)—105×.12½=13.13
(16)—115×.12½=14.37
(17)—130×.12½=16.25
(18)—145×.12½=18.12
(19)—50×.16⅔=8.33
(20)—75×.16⅔=12.5
(21)—85×.16⅔=14.17
(22)—90×.16⅔=15.
(23)—95×.16⅔=15.83
(24)—105×.16⅔=17.5
(25)—50×.33⅓=16.67
(26)—70×.33⅓=23.33
(27)—80×.33⅓=26.67
(28)—95×.33⅓=31.67
(29)—110×.33⅓=36.67
(30)—115×.33⅓=38.33
(31)—75×.62½=46.87
(32)—90×.62½=56.25
(33)—105×.62½=65.62
(34)—115×.62½=71.87
(35)—130×.62½=81.25
(36)—145×.62½=90.62
(37)—60×.83⅓=50.
(38)—65×.83⅓=54.16
(39)—70×.83⅓=58.33
(40)—75×.83⅓=62.5
(41)—80×.83⅓=66.66
(42)—90×.83⅓=75.
(43)—95×.83⅓=79.16
(44)—105×.83⅓=87.5
(45)—105×.87½=91.87
(46)—110×.87½=96.25
(47)—120×.87½=105.
(48)—125×.87½=109.37
(49)—130×.87½=113.75
(50)—135×.87½=118.12
(51)—140×.87½=122.5
(52)—$50×1.05=$52.50
(53)—$75×1.10=$82.50
(54)—$90×1.15=$103.50 (book wrong)
(55)—$100×1.20=$120
(56)—$40.50×1.20=$48.60
(57)—$56.15×1.25=$70.19
(58)—$62.50×1.25=$78.13
(59)—$25×1.06¼=$26.56

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(60)—$110.×125%=$137.50
(61)—$125.×125%=$156.25
(62)—$15.50×105%=$16.28
(63)—$20.25×110%=$22.28
(64)—$35.10×115%=$40.37
(65)—$35.50×112½%=$39.94
(66)—$50.75×112½%=$57.09
(67)—$125.50×137½%=$172.56
(68)—$162.50×137½%=$223.44
(69)—$162.50×162½%=$264.06
(70)—5%×10%×$50.=.25
(71)—5%×10%×$75.=.37½
(72)—5%×10%×$100.=.50
(73)—10%×20%×$100.=$2.
(74)—10%×25%×$120.=$3.
(75)—10%×3%×$125.50=3.77
(76)—15%×30%×$250.=$11.25
(77)—20%×30%×$375.=$22.50
(78)—30%×50%×$500.=$75.
(79)—40%×50%×$1,000.=$200.
(80)—25÷250=10%
(81)—50÷450=11 1/9%
(82)—110÷750=20%
(83)—125÷625=20%

(84)—150÷750=20%
(85)—160÷800=20%
(86)—200÷990=20.2%
(87)—240÷1200=20%
(88)—270÷1350=20%
(89)—450÷1500=30%
(90)—$12.50÷$50=25%
(91)—$12.50÷$90.=13.8%
(92)—$12.50÷$100=12½%
(93)—$12.50÷$125.=10%
(94)—$16.25÷$150.=10.8%
(95)—$18.75÷$175.=10.7%
(96)—$27.50÷$225.=12.2%
(97)—$32.50÷$250.=13%
(98)—$37.50÷$300.=12½%
(99)—$62.50÷$400.=15.6%
(100)—$3.10÷$12.40=25%
(101)—$3.75÷$18.75=20%
(102)—$4.50÷$22.50=20%
(103)—$6.75÷$37.50=18%
(104)—$6.25÷$50.=12½%
(105)—$6.25÷$62.50=10%
(106)—$12.50÷$75.=16⅔%
(107)—$37.50÷$87.50=42.8%
(108)—$37.50÷$112.50=33⅓%
(109)—$62.50÷$137.50=45.4%
(110)—15%=42 1%=2.8 100%=280.
(111)—20%=⅕=65 5/5=325.
(112)—18%=90 1%=5 100%=500
(113)—25%=¼=120 4/4=480
(114)—10%=1/10=12.5 10/10=125.
(115)—25%=¼=15.6 4/4=62.4
(116)—30%=3/10=125.7 10/10=419.
(117)—40%=⅖=225.25 5/5=563.12½
(118)—25%=¼=.15 4/4=.6
(119)—20%=.004 5/5=.02
(120)—37½%=⅜=.117 8/8=.312
(121)—62½%=⅝=.0025 8/8=.004
(122)—8%=$1.25 1%=$.1563 100%=$15.63
(123)—10%=1/10=$2.75 10/10=$27.50
(124)—12½%=⅛=$3.50 8/8=$28.
(125)—20%=⅕=$4.50 5/5=$22.50
(126)—12½%=⅛=$12. 8/8=$96
(127)—62½=⅝=$50. 8/8=$80.
(128)—80%=⅘=$75. 5/5=$93.75
(129)—16⅔%=⅙=$225. 6/6=$1350.
(130)—33⅓%=⅓=$375. 3/3=$1,125.
(131)—62½%=⅝=$625. 8/8=$1,000.

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(1)—$?×.15=$3000; $3000.00÷.15=$20,000
(2)—$550.00÷$27500=.02=2%
(3)—⅓+⅕=8/15; 15/15—8/15=7/15=.46⅔ or 46⅔%
(4)—$4200÷15=$280; $280+($280×.15=$42)=$322
(5)—$16+$23=$39; $39.00÷780=.05=5%
(6)—$3.84÷32=.12 per qt. .15—.12=.03; .03÷.12=.25 or 25%
.03÷.15=.20 or 20%
(7)—$75=.20×$?; $75.00=.20=$375; $375—$75=$300;
$300.00÷1.20=250.
(8)—.30—.20=.10; $200=.10×$?; $200.00÷.10=$2000

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(9)—$6.75×.05=$.33¾; 140×$.33¾=$47.25.
(10)—1.00+.30=1.30; 1.30—(1.30×.20=.26)=1.04; $1240.00÷1.04=$1192.3
(11)—$3.00÷60=.05 s. p; 1.00+.20=1.20; $3.00÷1.20=$2.50; $2.50÷60=$.04⅙ cost
(12)—$45600—$600=$45000; $45000.00÷$67500=.33⅓ or 33⅓%
(13)—$1800+($1800×.25=$450)=$2250; $2250—($2250×.25=$562.50)=$1687.50; $1800.0000÷$1687.50=.93¾=93¾%
(14)—$1875×.25=$468.75; $468.75÷.15=$3125

(15)—$12000+(12000×.20=$2400)=$14400; $12000+($12000×
$3600)=$15600; $12000+($12000×.25=$3000.00)=$1
$12000+$14400+$15600+$15000=$57000
(16)—375×2400×$140—$1260; .25×2400×$1.60=$9.60; 1.00—.
.25=.375; .375×2400×$1.50=$1350; $1260+$960+$1
$3570; $3570—($1.25×2400=$30000)=$570
(17)—$4.20+$.125=$4.325; $5.00—$4.325=$.675; $.675÷$4.
.153 or 15.3%; $.125÷$4.20=.02 41/42 or 2 41/42%

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(18)—1190.00÷.85=1400; 1400—1190=210; 1190×$.65=$77
210×$.55=$115.50; $773.50+ $115.50=$889
(19)—1.00—.70=.30; 630.00÷.30=2100
(20)—$50.00÷$240=.20 5/6 or 20 5/6%
(21)—.80×240=192; 2.4×$14.40=$34.56; $34.56÷192=$.18
(22)—308—140=168; 168.00÷308=.54 6/11 or 54 6/11%
(23)—1100×.62=682; 1100×.51=561; 682+561=1243; 1243×.
$142.945
(24)—$368.75+$165=$533.75; $165.0000÷$533.75=.309=30.9%
(25)—1200+500+300=2000; 1200.00÷2000=.60 or 60%; 50
2000=.25 or 25%; 300.00÷2000=.15 or 15%
(26)—200×.60=120; 200×.25=50; 200×.15=30

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(27)—2000×.02=40; 40×$.16=$6.40; 2000×.08=160; 160×
$9.60; $6.40+$9.60=$16.00
(28)—500×60=30000×.002=60
(29)—2×2000×.019=76; 1.5×2000×.024=72; 76+72=148
(30)—7200×.033=237.6; 5400×.051=275.4
(31)—4500×.033=148.50; 4500×.054=243; 243—148.5=94.5
(32)—18×40=720; 9×30=270; 5×22=110; 720+270+110=
1100×.036=39.6
(33)—8×40×.052=16.64; 7×30×.045=9.45; 5×24×.036=4.32;
+9.45+4.32=30.41
(34)—5000×.054×1⅙×$.55=$173.25

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(1)—$40×.10=$4
(2)—$60×.10=$6
(3)—$65×.12=$7.80
(4)—$75×.15=$11.25
(5)—$90×.20=$18
(6)—$95×.20=$19
(7)—$100×.12½=$12.50
(8)—$125×.16 2/3=$20 5/6
(9)—$150×.15=$22.50
(10)—$200×.20=$40
(11)—$275×.15=$41.25
(12)—$350×.25=$87.50
(13)—$125.50×.05=$6.275
(14)—$240.25×.08=$19.22
(15)—$360.75×.07=$25.25
(16)$4500×.12½=$562.50
(17)—$20,000×.16=$3200
(18)—$35,000×.25=$8750
(19)—$100+($100×.15=$15)=$115
(20)—$125+($125×.20=$25)=$150
(21)—$130+($130×.16=$20.80)=$150.80
(22)—$160+($160×.25=$40)=$200
(23)—$190+($190×.20=$38)=$228
(24)—$200+($200×.15=$30)=$230
(25)—$200+($200×.10=$20)=$220
(26)—$250+($250×.15=$37.50)=$287.50
(27)—$300+($300×.12½=$37.50)=$337.50
(28)—$400+($400×.16⅔=$66.67)=$466.67
(29)—$450+($450×.20=$90)=$540
(30)—$750+($750×.25=$187.50)=$937.50 (Book wrong)

(31)—$245.50+($245.50×.12=$29.46)=$274.96
(32)—$375.20+($375.20×.15=$56.28)=$431.48
(33)—$454.95+($454.95×.15=$68.24)=$523.19
(34)—$580.61+($580.61×.20=$116.12)=$696.73
(35)—$7500+($7500×.20=$1500)=$9000
(36)—$12,750+($12,750×.33⅓=$4,250)=$17,000
(37)—$500×.10=$50
(38)—$600×.15=$90
(39)—$750×.15=$112.50
(40)—$900×.20=$180
(41)—$925×.25=$231.25
(42)—$975×.30=$292.50
(43)—$1275.50×.10=$127.55
(44)—$2450.75×.12½=$306.34
(45)—$3575.25×.16⅔=$595.88
(46)—$4110.75×.16⅔=$685.13
(47)—$25,750×.33⅓=$8,583.33
(48)—$27,580×.37½=$10,342.50
(49)—$1,200—($1,200×.15=$180)=$1,020
(50)—$1,500—($1,500×.12½=$187.50)=$1,312.50
(51)—$1750—($1750×.15=$262.50)=$1487.50
(52)—$2500—($2500×.15=$375)=$2125
(53)—$3750—($3750×.15=$562.50)=$3187.50
(54)—$4250—($4250×.20=$850)=$3400
(55)—$1250.50—($1250.50×.10=$125.05)=$1125.45
(56)—$1975.50—($1975.50×.12½=$246.94)=$1728.56
(57)—$2150.80—($2150.80×.12½=$268.85)=$1881.95
(58)—$3675.20—($3675.20×.15=$551.29)=$3123.92
(59)—$5490.50—($5490.50×.15=$823.575)=$4666.925
(60)—$6252.75—($6252.75×.16⅔=$1042.125)=$5210.625

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(1)—10%=$75; 100%=$750
(2)—12%=$125; 100%=1041⅔
(3)—15%=$250; 100%=$1,666⅔
(4)—12½%=$500; 100%=$4,000
(5)—16⅔%=$625; 100%=$3,750
(6)—5%=$30; 100%=$600
(7)—7½%×$45; 100%=$600
(8)—6¾%=$67.50; 100%=$1,000
(9)—12½%=$125; 100%=$1,000
(10)—16⅔%=$250; 100%=$1,50

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(1)—$400—$300=$100÷$300=33⅓%
(2)—$540—$450=$90÷$450=20%
(3)—$550—$500=$50÷$500=10%
(4)—$575—$500=$75÷$500=15%
(5)—$1000—$750=$250÷$750=33⅓%
(6)—$1168—$876=$292÷$876=33⅓%
(7)—$300—$270=$30÷$300=10%
(8)—$375—$300=$75÷$375=20%
(9)—$450—$400=$50÷$450=11 1/9%
(10)—$600—$500=$100÷$600=16⅔%
(11)—$1200—$900=$300÷$1200=25%
(12)—$1800—$1500=$300÷$1800=16⅔%

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(1)—$2400×.15=$360
(2)—$2670—$2400=$270÷$2400.00=11¼%
(3)—15%=$360; 1%=$24; 100%=$2400
(4)—100%+15%=115%=$1,173. 100%=$1,020÷1700=.60
(5)—$4200×.16⅔=$700

(6)—$40×.05=$2.00; $40—$2=$38×.15=$5.70—$2=$3.70+$40= $43.70
(7)—$200×.20=$40+$200=$240×.80=$192. $200—$192=$8.00÷$200 =4%
(8)—400×.085=$34; 100%+25%=125%=$34; 100%=$27.20
(9)—120%—100%=20%=.80 100%=$4.00+.80=$4.80
(10)—100%—10%=90%; 100%+15%=115%—90%=25%÷90%= 27 7/9%
(11)—.09×5=.45×.20=.09+45=.54
(12)—$43.75—$35=$8.75÷$35=.25×$48=$12+$48=$60

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(13)—100%—12½%=87½%=⅞=$3.50 8/8 or 100%=$4.00×.25= $1.00+$4.00=$5
(14)—$9—($8+.35)=.65÷$8=.08⅛
(15)—120×$60=$7200+$1800=$9000×.15=$1350+$9000=$10,350 ÷120=$86.25
(16)—$2.40×.20=.48+$2.40=$2.88; $2.40×.20=.48; $2.40—.48= $1.92×25=$48; $2.88×25=$72+$48=$120; $2.40×50=$120 —$120=0
(17)—$3.90÷20=.19½+.03=.22½; .45—.22½=.22½÷22½=100%
(18)—$7500×.40=$3,000+$7500=$10,500; $12,600—$10,500=$2,100÷ $10,500=20%
(19)—100%+20%=120%=$4500; 100%=$3750 100 %—20%=80% =$4,500; 100%=$5,625+$3,750=$9,375; $4,500×2=$9,000; $9,375—$9,000=$375÷$9,375=.04

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(1) — 100% —10%—12%=78%=$100.00; 1%=$1.28205; 100%= $128.205
(2)—100%—15%—12%=73%=$100; 1%=$1.3698; 100%=$136.98
(3)—100%—12%—25%=63%=$125; 1%=$1.9841; 100%=$198.41
(4)—100%—16%—20%=64%=$240; 1%=$3.75; 100%=$375
(5)—100%—25%—25%=50%=$500; 1%=$10; 100%=$1,000
(6)—100%—18%—20% =62%=$1150.50; 1%=$18.55645; 100%= $1855.645
(7)—100%—12%—25%=63%=$1,875.90; 1%=$29.7762; 100%= $2,977.62
(8)—100%—10%—12%=78%=$2,750; 1%=$35.2564; 100%=$3525.64
(9)—100%—12%—15%=73%=$10,575.50; 1%=$144.8697; 100%= $144,486.97
(10)—100%—15%—20%=65%=$24,500; 1%=$376.92307; 100%= $37,692.307
(11)—$1500+$35=$1535; 100%—16%—12%=72%=$1,535; 1%= $21.3194; 100%=$2131.94
(12)—100%—25%—20%=55%=($2,400+(⅛% of $2,400=$3)= $2,403) 1%=$43.6909; 100%=$4369.09
(13)—100%—15%—20%=65%=$3,750 1%=$57.6923; 100%= $5,769.23

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(1)—$100×.15=$15
(2)—$125×.10=$12.50
(3)—$150×.20=$30
(4)—$150×.25=$37.50
(5)—$260×.30=$78
(6)—$375×.40=$150
(7)—$275.50×.10=$27.55
(8)—$354.00×.12½=$44.20
(9)—$375.25×.16⅔=$62.54
(10)—$465.90×.33⅓=$155.30
(11)—$525.75×.30=$157.73
(12)—$775.40×.33⅓=$258.47
(13)—$27.50—($27.50×.10=$2.75)=$24.75

(14)—$45.90—($45.90×.15=$6.88)=$39.02
(15)—$96.75—($96.75×.12½=$12.09)=$84.66
(16)—$115.10—($115.10×.20=$23.02)=$92.08
(17)—$175.87—($175.87×.25=$43.97)=$131.90
(18)—$290.05—($290.05×.30=$87.02)=$203.03
(19)—$54.50—($54.50×.12½=$6.81)=$47.69
(20)—$75.90—($75.90×.15=$11.38)=$64.52
(21)—$110.50—($110.50×.20=$22.10)=$88.40
(22)—$250.50—($250.50×.25=$62.62)=$187.88
(23)—$375.90—($375.90×.37⅓=$140.34)=$235.56
(24)—$625.45—($625.45×.40=$250.18)=$375.27
(1)—$24×.20=$4.80
(2)—$24×.20=$4.80 $24—$4.80=$19.20
(3)—$24—$19.20=$4.80÷$24=.20
(4)—2.00—$1.60=.40÷$2=.20
(5)—$450—($450×.10=$45)=$405
(6)—$6.40×25=$160—($160×.05=$8)=$152

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(7)—100%—16⅔%=83⅓%=⅚; 16⅔%=⅙%=$27⅚=5×$27=$135
(8)—$2750—$2475=$275.÷$2750.=.10=10%
(9)—$2.60×.20=.52; $2.60—.52=$2.08
(10)—$450.90×.01=$4.509; $450.90—$4.51=$446.39
(11)—$25×.20=$5; $25.—$5.=$20.×.40=$8.+$20=$28
(12)—$83.×.05=$4.15; $83.—$4.15=$78.85+$1.15=$80
(13)— $1125÷3=$375×.15=$56.25; $375—$56.25=$318.75)+($1125 —$375=$750.×.20=$150; $750—$150=$600)=$918.75
(14)—100%+25%=125%=$300; 100%=$240; 100%—10%=90%= $240; 100%=$266.66⅔=$266.67
(15)—100%—16⅔%=83⅓%=⅚; 16⅔%=⅙=$240; ⅚=$1200+ $20=$1220×.20=$244+$1220=$1464
(16)—$150×.33⅓=$50+$150=$200.×.25=$50; $200—$50=$150— $150=0

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(17)—$6.25×.20=$1.25; $6.25—$1.25=$5.00÷100=.05; .10—.05=.05÷ .05=100%
(18)—$20÷12=$1.66⅔×3=$5.×.20=$1.+$5.=$6. $20—$5=$15.×.25 =$3.75. $15—$3.75=$11.25+$6.00=$17.25 $20—$17.25=$2.75
(19)—$4800×.12½=$600; 640—$600=$40
(20)—(5000×$1=$5000×.40=$2000; $5000—$2000=$3000) 2000× $1.=$2000; 1600×.75=$1200; 1000×.50=$500; 5000—(2000 +1600+1000)=400×.25=$100+$2000 ×$1200+$500=$3800— $3000=$800
(21)—100×$22.50=$2250×.10=$225. $2250×.05=$112.50; $225— $112.50=$112.50
(22)—$67500×.05=$3375; $67,500—$3375=$64,125×.15=$9618.75
(23)—($2000×.15=$300; $2000—$300=$1700×.10=$170. $1700— $170=$1530×.20=$306+$1530=$1836) $2000×.25=$500. $2000— $500=$1500×.25=$375+$1500=$1875 $1875—$1836=$39
(24)—($1180×.10=$118; $1180—$118=$1062)+($750×.20=$150; $750—$150=$600)+$960×.12½=$120; $960—$120=$840×.05 =$42. $840—$42=$798)=$2460.

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(1)—$75×.10=$7.50; $75—$7.50=$67.50×.05=$3.37½; $67.50— $3.37½=$64.12½ or $64.13
(2)—$90×.10=$9; $90—$9=$81.×.05=$4.05; $81—$4.05=$76.95

(3)—$100×.20=$20; $100—$20=$80×.10=$8; $80.—$8.=$72

(4)—$125×.20=$25; $125—$25=$100×.15=$15; $100—$15=$85

(5)—$150×.25=$37.50; $150—$37.50=$112.50×.20=$22.50; $112.50 —$22.50=$90

(6)—$350×.15=$52.50; $350—$52.50=$297.50×.10=$29.75; $297.50 —$29.75=$267.75×.05=$13.33¾; $267.75—$13.39=$254.36

(7)—$400×.10=$40; $400—$40=$360×.08=$28.80; $360—$28.80= $331.20×.05=$16.56; $331.20—16.56=$314.64

(8)—$575×.20=$115; $575—$115=$460×.08=$36.80; $460—$36.80 =$423.20×.05=$21.16; $423.20—$21.16=$402.04

(9)—$790×.10=$79; $790—$79=$711×.10=$71.10; $711—$71.10= $639.90×.10=$63.99; $639.90—$63.99=$575.91

(10)—$950×.25=$237.50; $950 — $237.50 = $712.50 × .20 = $142.50; $712.50—$142.50=$570×.10=$57; $570—$57=$513

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(1)—$600×.20=$120; $600—$120=$480×.10=$48; $480—$48=$432

(2)—$240×.20=$48; $240—$48=$192×.15=$28.80; $192—$28.80= $163.20×.10=$16.32; $163.20—$16.32=$146.88

(3)—$1.00×20%=.20; $1.00—.20=.80×.10=.08; .80—.08=.72; $1.00 —.72=.28; .28÷.72=38 8/9%

(4)—$18×.10=$1.80; $18—$1.80=$16.20×.05=.81; $16.20—.81=$15.39 $20—15.39=$4.61

(5)—($90×.20=$18; $90—$18=$72×.10=$7.20; $72—$7.20=$64.80) ($65.02½—$64.80=.22½) ($90×.15=$13.50; $90—$13.50=$76.50 ×.15=$11.475; $76.50—$11.47½=$65.02½)

(6)—($1500×.10=$150; $1500—$150=$1350×.05=$67.50; $1350—$67.50=$1282.50) $1500×.08=$120; $1500—$120=$1380×.02= $27.60; $1380—$27.60=$1352.40—1282.50=$69.90

(7)—$1200×.15=$180; $1200—$180=$1020×.10=$102; $1020—$102 =$918×.05=$45.90; $918—$45.90=$872.10; $1200×.05=$60; $1200—$60=$1140×.10=$114; $1140—$114=$1026×.15=$153.90 $1026—$153.90=$872.10

(8)—$750×.20=$150; $750—$150=$600×.20=$120; $600—$120=$480 $120÷$480=25%

(9)—($275×.25=$68.75; $275—$68.75=$206.25)—$199.85⅝=$6.39 ($275×.15=$41.25; $275—$41.25=$233.75×.10=$23.375; $233.75 — $23.375 = $210.375) $210.375 × .05 = $10.51⅞; $210.37½ — $10.51⅞=$199.85⅝

(10)—$45×.20=$9; $45—$9=$36×.10=$3.60; $36—$3.60=$32.40× 10=$324; $324×.25=$81

(11)—$250×.20=$50; $250—$50=$200×.05=$10; $200—$10=$190× .20=$38+$190=$228×.05=$11.40; $228—$11.40=$216.60—$190 =$26.60

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(1)—12 Dining tables @ $16.50	$198.00
36 Chairs @ $2.25	81.00
15 Couches @ $10.75	161.25
18 Morris chairs @ $10.25	184.50
Gross	$624.75
Less 15%	93.71
	$531.04
Less 10%	53.10
Net	$477.94

(Book wrong)

(2)—100 Cases lemons @ $4.25	$4250.00
60 Cases oranges @ $5.60	336.00
200 Bunches bananas @ $1.35	270.00
30 Doz. pineapples @ $1.20	36.00
Gross	$1067.00
Less 20%	213.40
	$853.60
Less 12½%	106.70
Net	$746.90

(3)—200 Yards Brussels Carpet @ $1.80	$ 360.00
300 Yards Ingrain Carpet @ $1.40	420.00
145 8'3"x10'6" Rugs @ $20.00	2900.00
80 6'x9' Rugs @ $14.00	1120.00
Gross	$4800.00
Less 25%	1200.00
	$3600.00
Less 5%	180.00
Net	$3420.00

(4)—15 Dozen ties @ $4.2[illegible]	$ [illegible]
3 Dozen ties @ $12[illegible]	[illegible]
4 Dozen ties @ $1[illegible]	[illegible]
6 Dozen gloves @ [illegible]	[illegible]
18 Dozen gloves @ $1[illegible]	[illegible]
35 Dozen belts @ [illegible]	[illegible]
5 Gross handkerchiefs @ [illegible]	[illegible]
	[illegible]
Less [illegible]	[illegible]
	[illegible]
Less [illegible]	[illegible]
[illegible]	[illegible]

—5 Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
4 Dozen [illegible]	[illegible]
5 Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
5 Dozen [illegible]	[illegible]
[illegible] Dozen [illegible]	[illegible]
4 Dozen [illegible]	[illegible]
	[illegible]
[illegible]	[illegible]
	[illegible]

INTEREST.

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(1)—$1000 at .05=$50 int. for 1 yr.
4×$50=$200 int. for 4 yrs.
(2)—$1200 at .06=$72 int. for 1 yr.
3×$72=$216 int. for 3 yrs.
(3)—$1750 at .04½=$78.75 int. for 1 yr.
5×$78.75=$393.75 int. for 5 yrs.
(4)—$125.50 at .05=$6.275 int. for 1 yr.
3×$6.275=$18.825 or $18.83 int. for 3 yrs.
(5)—$225.75 at .04=$9.03 int. for 1 yr.
5×$9.03=$45.15 int. for 5 yrs.
(6)—$457.25 at .054=$24.6915 int. for 1 yr.
4×$24.6915=$98.766 or $98.77 int. for 4 yrs.
(7)—$700 at .06=$42 int. for 1 yr.
2½×$42=$105 int. for 2 yrs. 6 mo.
(8)—$1400 at .03=$42 int. for 1 yr.
3 1/4×$42=$136.50 int. for 3 yrs. 3 mo.
(9)—$2100 at .04=$84 int. for 1 yr.
4 5/6×$84=$406 int. for 4 yrs. 10 mo.
(10)—$135.80 at .05=$6.79 int. for 1 yr.
3 1/3=$6.79=$22.63 int. for 3 yrs. 4 mo.
(11)—$457.75 at .04=$18.31 int. for 1 yr.
22 7/12×$18.31=$413.50 int. for 22 yrs. 7 mo.
(12)—$675.50 at .05=$33.775 int. for 1 yr.
4 5/12×$33.775=$149.17 int. for 4 yrs. 5 mo.
(13)—$300 at .04=$12 int. for 1 yr.
6 mo.=12/24 yr. 15 da.=1/24 yr.
12/24 yr.+1/24 yr.=13/24 yr.
2 13/24 ×$12=$30.50 int. for 2 yrs. 6 mo. 15 da.

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(14)—$450 at .05=$22.50 int. for 1 yr.
8 mo.=2/3 yr. or 40/60 yr.
18 da.=18/360 or 3/60
40/60+3/60=43/60 yr.
3 43/60×$22.50=$83.63 int. for 3 yrs. 8 mo. 18 da.
(15)—$600 at .04½=$27 int. for 1 yr.
3 mo.=3/12 or 90/360 yr.
6 da.=6/360 yr.
90/360+6/360=96/360 or 4/15 yr.
5 4/15×$27=$142.20 int. for 5 yrs. 3 mo. 6 da.
(16)—$900 at .04½=$40.50 int. for 1 yr.
2 mo.=1/6 or 20/120 yr.
3 da.=3/360 or 1/120 yr.
20/120+1/120=21/120 or 7/40 yr.
2 7/40×$40.50=$88.09 int. for 2 yrs. 2 mo. 3 da.
(17)—$1250 at .05=$62.50 int. for 1 yr.
11 mo.+24 da.=59/60 yr.
3 59/60×$62.50=$248.95 int. for 3 yr. 11 mo. 24 da.
(18)—$1800 at .05=$90 int. for 1 yr.
9 mo. 20 da.=29/36 yr.
2 29/36×$90=$252.50 int. for 2 yrs. 9 mo. 20 da.
(19)—$2500 at .06=$150 int. for 1 yr.
7 mo. 25 da.=47/72 yr.
3 47/72×$150=$547.92 int. for 3 yrs. 7 mo. 25 da.

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Six Per Cent Method: Call ½ the months cents and 1/6 the days mills:

(1)—24+5=29 mo.
1/2 of 29=.145
1/6 of 12=.002
Int. on $1 for given time=.147
Int. on $150=150×.147=$22.05

(2)—24+9=33 mo.
1/2 of 33=.165
1/6 of 18=.003
Int. on $1 for given time=.168
Int. on $225=225×.168=$37.8

(3)—36+8=44 mo.
1/2 of 44=.22
1/6 of 24=.004
Int. on $1 for given time=.224
Int. on $290.50=290.50×.224=$65.07

(4)—24+10=34 mo.
1/2 of 34=.17
1/6 of 6=.001
Int. on $1 for given time=.171
Int. on $210.50=210.50×.171=$35.99

(5)—36+7=43 mo.
1/2 of 43=.215
1/6 of 15=.0025
Int. on $1 for given time=.2175
Int. on $342.12=342.12×.2175=$74.41

(6)—24+8=32 mo.
½ of 32=.16
1/6 of 17=.0028 1/3
Int. on $1 for given time=.1628 1/3
Int. on $497.18=497.18×.1628=$80.975 or $80.96

(7)—36+5=41 mo.
1/2 of 41=.205
1/6 of 25=.004 1/6
Int. on $1 for given time=.209 1/6
Int. on $654.32=654.32×.209 1/6=$136.86

(8)—36+7=43 mo.
1/2 of 43=.215
1/6 of 17=.0028 1/3
Int. on $1 for given time=.2178 1/3
Int. on $872.19=872.19×.2178 1/3=$189.99

(9)—36+11=47 mo.
1/2 of 47=.235
1/6 of 5=.0008 1/3
Int. on $1 for given time=.2358 1/3
Int. on $1024.17=1024.17×.2358 1/3=$241.53

(10)—12+1=13 mo.
1/2 of 13=.065
1/6 of 19=.003 1/6
Int. on $1 for given time=.068 1/6
Int. on $1024.17=1024.17×.086 1/6=$239.41

(11)—24+10=34 mo.
1/2 of 34=.17
1/6 of 27=.0045
Int. on $1 for given time=.1745
Int. on $4672.20=4672.20×.1745=$810.936 or $810.94

(12)—12+8=20 mo.
1/2 of 20=.10
1/6 of 26=.004 1/3
Int. on $1 for given time=.104 1/3
Int. on $869.15=869.15×.104 1/3=$90.68

(13)—1919— 3— 1
1918— 1— 1
1— 2— 0
12+2=*14*
1/2 of 14=.07
Int. on $1 for given time=.07
Int. on $250=250×.07=$17.50

(14)—1919— 7— 1
1917— 4— 1
2— 3— 0
24+3=27
1/2 of 27=.135
Int. on $1 for given time=.135
Int. on $375=375×.135=$50.625 or $50. 63

(15)—1918— 5—16
1916— 3—10
2— 2— 6
24+2=26 mo.
1/2 of 26=.13
1/6 of 6=.001
Int. on $1 for given time=.131
Int. on $500=500×.131=$65.50

(16)—1919— 7—19
1918— 6— 1
1— 1—18
12+1=13 mo.
1/2 of 13=.065
1/6 of 18=.003
Int. on $1 for given time=.068
Int. on $275.50=275.50×.068=$18.75

(17)—1920— 1—10
1917—10— 1
2— 3— 9
24+3=27 mo.
1/2 of 27=.135
1/6 of 9=.0015
Int. on $1 for given time=.1365
Int. on $457.80=457.80×.1365=$62.489 or $62.49

(18)—1919—10—16
1916— 3— 1
3— 7—15
36+7=43 mo.
1/2 of 43=.215
1/6 of 15=.0025
Int. on $1 for given time=.2175
Int. on $625.50=625.50×.2175=$136.05

(19)—1919— 1—25
1915— 4—11
3— 9—14
36+9=45 mo.
1/2 of 45=.225
1/6 of 14=.00233
Int. on $1 for given time=.22733
Int. on $1275=1275×.22733=$289.85

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(20)—1919— 7—29
1918— 6—11
1— 1—18
12+1=13 mo.
1/2 of 13=.065
1/6 of 18=.003
Int. on $1 for given time=.068
Int. on $2500=2500×.068=$170

(21)—1918— 6—30
1917— 9—11
— 9—19
9 mo.
1/2 of 9=.045
1/6 of 19=.003 1/6
Int. on $1 for given time=.045 1/6
Int. on $3000=3000×.045 1/6=$144.50

(22)—1920— 1—19
1916— 9—11
3— 4— 8
36+4=40 mo.
1/2 of 40=.20
1/6 of 8=.001 1/3
Int. on $1 for given time=.201 1/3
Int. on $5400=5400×.201 1/3=$1087.20

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(1)—3%=½ of 6% ∴ ½ of $274.60=$137.30
(2)—3%=½ of 6% ∴ ½ of $342.16=$171.08
(3)—3%=½ of 6% ∴ ½ of $454.48=$227.24
(4)—3%=½ of 6% ∴ ½ of $564.29=$282.145
(5)—4%=1/3 less than 6%
1/3 of $450.60=$150.20; $450.60—$150.20=$300.40
(6)—1/3 of $542.10=$180.70; $542.10—$180.70=$361.40
(7)—1/3 of $642.12=$214.04; $642.12—$214.04=$428.08
(8)—1/3 of $746.16=$248.72; $746.16—$248.72=$497.44
(9)—5% is 1/6 less than 6%
1/6 of $327.30=$54.55; $327.30—$54.55=$272.75
(10)—1/6 of $343.17=$57.195— $343.17—$57.195=$285.975
(11)—1/6 of $460.10=$76.68; $460.10—$76.68=$383.42
(12)—1/6 of $574.70=$95.78; $574.70—$95.78=$478.92
(13)—7% is 1/6 more than 6%
1/6 of $320.16=$53.36; $320.16+$53.36=$373.52

(14)—1/6 of $384.42=$64.07; $384.42+$64.07=$448.49
(15)—1/6 of $428.11=$71.35; $428.11+$71.35=$499.46
(16)—1/6 of $542.19=$90.365; $542.19+$90.365=$632.555
(17)—4½% is 1/4 less than 6%
1/4 of $64.96=$16.24; $64.96—$16.24=$48.72
(18)—1/4 of $72.48=$18.12; $72.48—$18.12=$54.36
(19)—1/4 of $68.76=$17.19; $68.76—$17.19=$51.57
(20)—1/4 of $85.19=$21.297; $85.19—$21.29=$63.90
(21)—5½% is 1/12 less than 6%
1/12 of $120.60=$10.05; $120—$10.05 $110.55
(22)—1/12 of $248.40=$20.70; $248.40—$20.70=$227.70
(23)—1/12 of $436.08=$36.34; $436.08—$36.34=$399.64
(24)—1/12 of $511.19=$42.59; $511.19—$42.59 $468.60
(25)—5.4%=.9 of 6%
.9×$110.19=$99.17
(26)—.9×$370.12=$333.108 or $333.11
(27)—.9×$340.16=$306.154
(28)—.9×$510.17=$459.15
(29)—6½%=1/12 more than 6%
1/12 of $627.12=$52.26; $627.12+$52.26 $679.38—(Book wrong.
(30)—1/12 of $518.28=$43.19; $518.28+$43.19=$561.47
(31)—1/12 of $642.10=$53.51; $642.10+$53.51=$695.61
(32)—1/12 of $754.09=$62.84; $754.09+$62.84=$816.93

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(1)—$\frac{\$200\times.05\times48}{365}\quad\$1.32$

(2)—$\frac{\$300\times.05\times48}{365}=\$1.56$

(3)—$\frac{\$325\times.06\times57}{365}=\$3.05$

(4)—$\frac{\$275\times.06\times69}{365}\quad\$3.25$

(5)—$\frac{\$425\times.06\times82}{365}\quad\$5.72$

(6)—$\frac{\$425\times.06\times69}{365}\quad\$4.62$

(7)—$\frac{\$570\times.055\times70}{365}\quad\$6.01$

(8)—$\frac{\$625\times.045\times87}{365}=\$6.70$

(9)—$\frac{\$750\times.065\times112}{365}=\$12.43$

(10)—$\frac{\$875\times.06\times164}{365}\quad\$23.59$

(11)—April 7 to June 12 66 da.
$\frac{\$235\times.06\times66}{365}\quad\$2.54$

(12)—May 10 to Oct. 16=159 da.
$\frac{\$345\times.65\times159}{365}=\$7.51$

(13)—June 3 to Aug. 12=70 da.
$\frac{\$457\times.06\times70}{365}=\$5.26$

(14)—Mar. 11 to Sept. 20=193 da.
$\frac{\$125\times.05\times193}{365}=\$3.32$

(15)—April 17 to Dec. 19=246 da.
$\frac{\$175.90\times.06\times246}{365}=\$7.11$

(16)—May 9 to Dec. 31 236 da.
$\frac{\$240.21\times.06\times236}{365}\quad\$9.32$

(17)—Oct. 10 to Mar. 7=148 da.
$\frac{\$275.38\times.055\times148}{365}\quad\$6.12$ (Book wrong)

(18)—Aug. 13 to Jan. 17 157 da.
$\frac{\$310.79\times.06\times157}{365}\quad\$8.02$

(19)—Sept 9 to Feb. 5=149 da.
$\frac{\$423.52\times.051\times149}{365}\quad\$9.02$

(20)—Dec. 30 to May 9 130 da.
$\frac{\$510.13\times.06\times130}{365}\quad\$10.91$

(21)—July 12 to Jan. 19 191 da.
$\frac{\$570.61\times.06\times191}{365}\quad\$17.92$

(22)—Apr. 15 to Mar. 14 334 da.
$\frac{\$627.15\times.05\times334}{365}\quad\$28.71$ (Book wrong)

(23)—May 23 to Feb. 4 257 da.
$\frac{\$895.56\times.06\times257}{365}\quad\$36.97$

(24)—July 19 to Oct. 27=100 da.
$\frac{\$900\times.05\times100}{365}=\$12.33$

(25)—Nov. 19 to Mar. 28=129 da.
$\frac{\$975.50\times.06\times129}{365}=\$20.68$

(26)—Dec. 18 to Sept. 18=274 da.
$\frac{\$1000\times.06\times91}{365}=\$25.04$

(27)—Jan. 19 to Aug. 17=210 da.
$\frac{\$1125\times.05\times210}{365}=\$32.36$

(28) Feb. 17 to Jan 11=327 da.
$\frac{\$1240.12\times.055\times327}{365}=\$61.11$ (Book wrong)

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(1)—From July 10 to Oct. 9=2 mo. 28 da.
$150×.06=$9÷12=.75÷30=.02½
.02½×28=.70. .75×2=$1.50+.70=$2.20

(2)—From May 7 to Aug. 15=3 mo. 8 da.
$200×.06=$12; $12÷12=$1.00÷30=.03⅓×8=.27
$1×3=$3+.27=$3.27

(3)—From Feb. 9 to June 17=4 mo. 8 da.
$375×.06=$22.50÷12=$1.876÷30=.062×8=.496
$1.875×4= $7.50+.496=$8.00

(4)—From April 17 to Oct. 11=5 mo. 24 da.
$450×.06=$27÷12=$2.25÷30=.07½×24=$1.80
$2.25×5=$11.25+$1.80=$12.05

(5)—From June 10 to Dec. 20=6 mo. 10 da.
$625×.06=$37.50÷12=$3.125÷30=.104
$3.125×6=$18.75+$1.04=$19.79

(6)—From Oct. 11 to Feb. 20=4 mo. 9 da.
$3.75÷30=.125×9=$1.125
$3.75×4=$15+$1.13=$16.13

(7)—From Jan. 11 to Oct. 15=9 mo. 4 da.
$925×.06=$55.50÷12=$4.625÷30=.154×4=.616
$4.625×9=$41.625+.616=$42.24

(8)—From May 15 to Dec. 18=7 mo. 3 da.
$1100×.06=$66÷12=$5.50÷30=.183×3=.549
$5.50×7=$38.50+.549=$39.049

(9)—From Aug. 11 to Jan. 19=5 mo. 8 da.
$1500×.06=$90÷12=$7.50÷30=.25×8=$2
$7.50×5=$37.50+$2=$39.50

(10)—From Nov. 18 to May 11=5 mo. 23 da.
$1650×.06=$99÷12=$8.25÷30=.275×23=$6.325
$8.25×5=$41.25+$6.32=$47.57

(11)—From Jan. 31 to Oct. 9=8 mo. 9 da.
$1875×.06=$112.50÷12=$9.375÷30=.312×9=$2.808
$9.375×8=$75+$2.81=$77.81

(12)—From Dec. 18 to Feb. 10=1 mo. 23 da.
$1576.50×.06=$94.59÷12=$7.88¼÷30=.2627
.2627×23=$6.05+$7.88=$13.93

(13)—From May 11 to June 5=25 da.
$3750.25×.06=$225.015÷360=.625×25=$15.63

(14)—From Dec. 30 to Feb. 28=1 mo. 29 da.
$5500×.06=$330÷12=$27.50÷30=.916×29=$26.57
$26.57+$27.50=$54.07

(15)—From Oct. 18 to Dec. 31=2 mo. 13 da.
$8500×.06=$510÷360=$1.416×13=$18.41
$42.50×2=$85+$18.41=$103.41

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(1)—$150×.06=$9×2=$18
(2)—$275×.06=$16.50×3=$49.50
(3)—$400×.06=$24×3=$72
(4)—$550×.05=$27.50×4=$110
(5)—$750×.07=$52.50×4=$210
(6)—$450×.06=$27÷12=$2¼×7=$15.75
$27×2=$54+$15.75=$69.75
(7)—$625×.05=$31.25÷12=$2.604×5=$13.02
$31.25×3=$93.75+$13.02=$106.77
(8)—$750×.07=$52.50÷12=$4.375×2=$8.75
$52.50×3=$157.50÷$8.75=$166.25
(9)—$900×.05½=$49.50÷12=$4.125×5=$20.63
$49.50×3=$148.50+$20.63=$169.13
(10)—$12.50×.06=$75÷12=$6.25×5=$31.25+ (2×$75=$150)= $181.25
(11)—$1225×.05=$61.25÷12=$5.104÷30=.170×10=$1.701
$5.104×5=$25.52+(2×$61.25=$122.50)+$1.701=$149.72
(12)—$2345×.06=$140.70÷12=$11.725÷30=.3908×5=$1.95
$140.70×3=$422.10+$1.95+(6×$11.725=$70.35)=$494.40
(13)—$3550×.06=$213÷12=$17.75÷30=.59×3=$1.77
$17.75×5=$88.75+($213×3=$639)+$1.77=$729.52
(14)—$4575×.05=$228.75÷12=$19.062÷30=.635×5=$3.175+ ($19.062×5=$95.31)+($228.75×3=$686.25)=$784.74
(15)—$5870×.06=$352.20÷12=$29.35÷30=.978×15=$14.67+ ($29.35×6=$176.10)+($352.20×3=$1056.60)=$1247.37 (Book wrong).
(16)—From Jan. 10 to Sept. 10=8 mo.
$450×.06=$27÷12=$2.25×8=$18.
(17)—From March 11 to Aug. 19=5 mo. 8 da.
$1200×.05=$60÷12=$5÷30=.166×8=$133+ ($5×5=$25)=$26.33
(18)—From Nov. 10, 1915 to Sept. 12, 1916=10 mo. 2 da.
$6000×.05=$300÷12=$25÷30=.833×2=$1.666+ (10×$25=$250)=$251.67 (Book wrong).
(19)—From March 12, 1918 to Sept. 12, 1918=6 mo.+6 mo. =1 yr.
$250×.06=$15
(20)—From May 1, 1918 to March 3, 1919=10 mo. 2 da.
From May 1, 1918 to June 1, 1919=1 yr. 1 mo.
Total time=1 yr. 11 mo. 2 da.
$500×.05=$25÷12=$2.08⅓÷30=.694×2=$1.39+ (11×$2.08⅓=$22.91)+$25+(2×$500=$1000)=$1,049.30 (Book wrong).

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(1)—$200.00 Deposit Jan. 1, 1918
4.00 Int. ½ yr.
$204.00 Amt. July 1, 1918
4.08 Int ½ yr.
$208.08 Amt. Jan. 1, 1919

(2)—$350.00 Deposit Jan. 1, 1916
3.50 Int. ¼ yr.
$353.50 Amt. Apr. 1, 1916
3.53 Int ¼ yr.
$360.60 Amt. Oct. 1, 1916
3.60 Int. ¼ yr.
$364.20 Amt. Jan. 1, 1917

(3)—

$350.00	Deposit Jan. 1, 1916
3.53	Int. ¼ yr.
100.00	Deposit Apr. 1, 1916
$453.53	Amt. Apr. 1, 1916
4.53	Int. ¼ yr.
100.00	Deposit July 1, 1916
$558.03	Amt. July 1, 1916
5.58	Int. ¼ yr.
100.00	Deposit Oct. 1, 1916
$663.61	Amt. Oct. 1, 1916
6.63	Int. ¼ yr.
$670.24	Amt. Jan. 1, 1919

(4)—

$1000.00	Deposit Jan. 1, 1916
15.00	Int. ½ yr.
$1015.00	Amt. July 1, 1916
400.00	Wthdrn. July 2, 1916
$615.00	
9.23	Int. ½ yr.
$624.23	Amt. Jan. 1, 1917

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(1)—Annual int. on 1st L. L. Bond =1000×.035=$35.00
(2)—Annual int. on 3rd L. L. Bond=.04¼×$3500=$148.75
(3)—Int. on 1st loan =.035 ×$200=$7.00
Int. on 2nd loan=.04 × 200= 8.00
Int. on 3rd loan=.04¼× 200= 8.50
Int. on 4th loan =.04¼× 200= 8.50
$32.00 Total An. Int.
(4)—Int on 1st loan=.035 ×$3000=$105.00
Int on 2nd loan .04 × 4000= 160.00
Int on 3rd loan .04¼× 5000= 212.50
Int. on 4th loan .04¼× 8000= 340.00
$817.50 Total An. Int.
(5)—An. Int on 1st loan .035×$3,035,226,850=$106,232,939.75
(6)—Average to each subscriber=$3,035,226,850÷4,500,000=$679.49
(7)—$4,176,516,850+$6,989,047,000=$11,165,563,850
Annual Int.=.04¼×$11,165,563,850=$477,536,463.63

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Note: Use deposit slips from local banks.

(1)—

Currency	$ 48.00
Gold	15.00
Silver	18.85
1st Natl. of Minn.	24.90
Phil. Commonwealth Trust	151.65
Chicago 1st Natl.	200.00
Total	$458.40

(2)—

Currency	$165.00
Gold	35.00
Silver	18.30
Minn., 4th Natl.	49.75
N. Y. Franklin Trust	54.10
Albany, Farmers Natl.	162.40
City bank of San. Fran.	119.87
Total	$604.42

(3)—

Currency	$245.00
Silver	19.70
Denver, 1st Natl.	136.00
Worcester, Mechanics Natl.	450.00
N. Y. Corn Exchange	178.50
K. C. Fidelity Trust	67.00
Total=	$1096.20

(4)—

Currency	$275.00
Gold	20.00
Silver	19.90
Detroit 1st Natl.	287.10
Phil. Com. Trust	98.15
Boston. Franklin Realty Trust	175.90
Malden Savings Bank	196.12
Total=	$1072.17

(5)—

Currency	$276.00
Silver	269.40
Cleveland 2nd Natl.	276.50
Rittenhouse Trust	115.00
N. Y. Chemical Natl	1500.00
Total=	$2436.90

(6)—Currency	$ 376.00
Gold	45.00
Silver	198.70
N. Y. Hanover Natl.	1100.00
Mech. Natl. Worcester	378.50
N. Y. Cent. U. Trust	1156.20
Ft. Dearborn Natl.	3120.57
Total	=$6374.97

(7)—Currency	$119.00
Gold	45.00
Silver	37.20
Chi. 1st Natl.	145.00
Galesburg 1st Natl.	100.00
Phil. 3rd Natl.	154.50
Fletcher Trust of Ind.	95.75
Boston 1st Natl.	85.10
Cleveland 2nd Natl.	45.00
N. Y. Chemical Natl	275.00
1st Natl., Augusta, Ga	78.75
Total	$1180.30

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1)

Union National Bank
Indianapolis, Ind., Jan. 6, 1919.

Pay to the order of Henry W. Breed $100 $\frac{00}{100}$

One hundred and $\frac{no}{100}$ .... Dollars

Thos. B. Wilcox.

Notice: Erasures on note should not be made.

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2)

Common Wealth Trust Co.
Phil., Jan. 6, 1919

Pay to the order of Chas. H. Bronson $47 $\frac{57}{100}$

Forty-seven and $\frac{57}{100}$ .... Dollars

Thos. B. Wilcox.

(3)

Mechanics National Bank
Birmingham, Ala. Jan. [illegible]

Pay to the order of Thomas D. [illegible]

Two hundred fifty and [illegible]

(4)

First National Bank
Louisville, [illegible]

Pay to the order of [illegible]

One hundred [illegible]

(5)

West End [illegible]
Phil. [illegible]

Pay to the [illegible]

Fourteen and [illegible]

—Pay to the order of the Cook Hardwa
Richard Roe.

)—Pay to the order of First Natl. Bank
Cook Hardware Co.

)—Corn Exchange Bank
New York, July 11, 1919

Pay to the order of Richard Roe $75 $\frac{00}{100}$

Seventy-five and $\frac{no}{100}$..

J. M. Gre

Indorsement across back:

Pay to the order of Exchange Natl. Bank,
Tulsa, Okla., for deposit.
Richard Roe.

(1)—$1275.90 Balance June 30
1871.95 Deposit
$3147.85
2705.10 Checks
$442.75 Balance July 31

(2)—$ 549.20 Bal. Aug. 1
2735.60 Deposit
$3284.80
1988.54 Checks
$1296.26 Bal. Aug. 31

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(3)—$2140.15 Bal.
480.19 Deposit
317.42 Deposit
694.48 Deposit
510.00 Deposit
178.10 Deposit
1039.54 Deposit
687.07 Deposit
2119.56 Deposit
$8166.51
4566.18 Checks
$3600.33 Balance

(4)—$ 2715.10
3510
1750.00
1862.57
697.25
598.69
$11,133.80 Deposit

$ 125.00
125.00
125.00
125.00
125.00
$2490.50
$3115.50 Checks

$11,133.80
3,115.50
$8,018.30

(5)—Mon.
$2917.12 Bal.
890.00 Deposit
$3807.12
1137.12 Checks
$2670.00 Bal.

Tues.
$2670.00 Bal.
762.40 Deposit
$3432.40
196.37 Check
$3236.03 Bal.

Wed.
$3236.03 Bal.
1317.00 Deposit
$4553.03
2762.10
$1790.93 Bal.

Thurs.
$1790.93 Bal.
1679.47 Deposit
$3469.40
584.14 Check
$2885.26 Bal.

(6)—$2156.53 Total Deposit
827.82 Total Checks
$1328.71 Balance

(7)—$6927.61 Total
5653.74 Total
$1273.89 Bala

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(1)—$300 face
.06

18.00 dis. for 1 yr.
1.50 dis. for ½ yr.

$300 face
1.50 bank dis.

298.50 pro.

(2)—350 face
$.06

21.00 dis. for 1 yr.
3.50 dis for 1/6 yr.

$350 face
3.50 dis.

$346.50 pro.

(3)—$450 face
.06

27.00 dis. 1 yr.
4.50 dis. 1/6 yr.

$450 face
4.50 dis.

$445.50 pro.

(4)—$575 face
.05

28.75 dis 1 yr.
7.19 dis. 1/4 yr.

$575 face
7.19 dis.

$567.81 pro.

(5)—$750 face
.06

45.00 dis. 1 yr.
7.50 dis. 1/6 yr.

$750 face
7.50 dis.

$742.50 pro.

(6)—$1000 face.
.06

60.00 dis. for 1 yr.
5.00 dis. 1/12 yr.

$1000 face
5 dis.

$ 995 pro.

(7)—$1500 face
.05

75.00 dis. 1 yr.
12.50 dis. 1/6 yr.

$1500 face
12.50 dis.

$1487.50 pro.

(8)—2250 face
.06

135.00 dis. 1 yr.
33.75 dis. 1/4 yr.

$2250 face
33.75 dis.

$2216.25 pro.

(9)—$2500 face
.05

125.00 dis. for 1 yr.
31.25 dis. for 1/4 yr.

$2500 face
31.25 dis.

$2468.75 pro.

(10)—$3000 face
.06

180.00 dis. 1 yr.
30.00 dis. 1/6 yr.

$3000 face
30 dis.

$2970 pro.

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(5)—$2500 face
.05
125.00 dis. 1 yr.
20.83 dis. 1/6 yr.

$2500 face
20.83 dis.
$2479.17 pro.

(6)—$3000 face
.05
150.00 dis. 1 yr.
25.00 dis. 1/6 yr.

$3000 face
25 dis.
$2975 pro.

Note: Use blank forms for notes and change to suit conditions. See p. 118 in book.

(7)—$4500 face
.055
247.500 dis. 1 yr.
41.25 dis 1/6 yr.

$4500 face
41.25 dis.
$4458.75 pro.

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(1)—Mch. 30 da. left
Apr. 30 date of maturity
60 da. term of dis.
$1000 face
.06
60.00 dis. for 1 yr.
9.86 dis. for $\frac{60}{365}$ or $\frac{12}{73}$ yr.
$1000 face
9.86 dis.
$990.14 pro.
∴ date of maturity= Apr. 30; term=60 da; dis.= $9.86; and pro.=$990.14.

(2)—Apr. 10 da. left
May 31
June 19 date of maturity
$\frac{60}{365}=\frac{12}{73}$ yr. term
$1100 face
.05
55.00 dis. for 1 yr.
9.04 dis. for $\frac{12}{73}$ yr.
$1100 face
9.04 dis.
$1090.96 pro.
∴ date of mat.=June 19; term=60 da.; dis.=$9.04 and *pro.=$1090.96.*

(3)—Mch. 21 da. left
Apr. 31
June 8 date of maturi[illegible]
May 31
90 time
Apr. 21 da left
May 31
June 8
60 term=$\frac{12}{73}$ yr.
$100 face
.06
6.00 int 1 yr.
1.50 int 1/4 yr.
100. face
$101.50 amt. at maturity
.05
5.0750 dis 1 yr.
.83 dis $\frac{12}{73}$ yr.
$101.50 amt.
.83 bank dis.
$100.67 proceeds.
∴ date of maturity=Jun[illegible]
term=60 da; dis.=$.83
proceeds=$100.67.

(4)—Jan. 30 da. left
Feb. 28
Mch. 2 date of maturity
60 term=$\frac{60}{365}=\frac{12}{73}$ yr.
$1000 face
.05
50.00 int for 1 yr.
8.33 int. 1/6 yr.
1000.
$1008.33 amt.
.05
50.4165 dis 1 yr.
8.29— dis. $\frac{12}{73}$ yr.

$1008.33 amt.
8.29 bank dis.
$1000.04 proceeds.
∴ date of maturity=Mch. 2; term=60 da.; dis.=$8.29, and pro.=$1000.04

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(5)—Mch. 21 da. left
Mch. 9 date of mat.
30 time
Mch. 15 da. left
Mch. 9
24 = $\frac{24}{365}$ term
$1200 face
.05
$60.00 int. 1 yr.
5.00 int. 1/12 yr.
1200
$1205 amt.
.05
60.25 dis 1 yr.
3.96 dis. $\frac{24}{365}$ yr.
$1205. amt.
3.96
$1201.04 pro.

(6)— $1500 face
.05
75.00 int 1 yr.
18.75 int 1/4 yr.
1500.
$1518.75 amt.
.06
$91.1250 dis. 1 yr.
14.98— dis. $\frac{60}{365}$ yr.
∴ $1518.75 amt.
14.98 dis.
$1503.77 pro.

(7)— $2000 face
.06
120.00 int. 1 yr.
30.00 int. 1/4 yr.
2000.
$2030. amt.
.05
$101.50 dis. 1 yr.
16.68 dis $\frac{60}{365}$ yr.
$2030. amt.
16.68 discount
$2013.32 proceeds.

(8)—June 29 da. left
July 31 date of mat
60 time
June 15 da. left
July 31
46=$\frac{46}{365}$ term
$1200 face
.05
60.00 int. 1 yr.
10. int. 1/60 yr.
$1200.
$1210.00 amt.
.05
60.50 dis. for 1 yr.
7.62 dis. for $\frac{46}{365}$ yr.
∴ $1210 amt.
7.62 dis.
$1202.38 proceeds.

(9)—Jan. 21 da. left
Feb. 28
Mch. 11 date of mat.
60 time
Jan. 6 da. left
Feb. 28
Mch. 11
$\frac{45}{365}=\frac{45}{365}=\frac{9}{73}$ yr.
$250 face
.06
15.00 int. 1 yr.
2.50 int. 1/6 yr.
250.
$252.50 amt.
.05
12.6250 dis. 1 yr.
1.56— dis $\frac{9}{73}$ yr.
$252.50 amt.
1.56 dis.
$250.94 proceeds.

(10)—Aug. 30 da. left
Sept. 30
Oct. 30 date of mat.
90 time
Sept. 10 da. left
Oct. 30
$\frac{40}{365}=\frac{40}{365}=\frac{8}{73}$ term
$450 face
.05
22.50 int. 1 yr.
5.63—int. 1/4 yr.
$450.
$455.63 amt.
.06
27.3378 dis. 1 yr.
3.00— dis $\frac{8}{73}$ yr.
$455.63 amt.
3. dis.
$452.63 pro.

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(1)—To find the face, divide the given proceeds by the proceeds on $1.
$1.00
.06
.06 dis. 1 yr.
.015 dis. 1/4 yr.
$1.00
.015 dis.
.985 pro. on $1
$295.50÷$.985=$300 face
∴ the face is $300.

(2)—$1.00
.05
.05 dis 1 yr.
.005/6 dis. 1/6 yr.
$1.00
.005/6 dis.
$.99\frac{1}{6}=\frac{5.95}{6}$ pro. on \$1.
$\$1498.50\div\$\frac{5.95}{6}=1487.50\times\frac{6}{5.95}=\$1500.$
∴ face=$1500.

(3)—$1—.01=.99 pro. on $1.00
$495÷$.99=$500 face
∴ face=$500

(4)—$1—$.015=$.985 pro. on $1
$641.87÷$.985=$651.64 face
∴ face=$651.64

(5)—$1—$.015=$.985 pro. on $1
$2000÷$.985=$2030.46 face
∴ he must make his note for $2030.46.

(6)—$1.00
.05 dis. 1 yr.
.05/6 dis. 1/6 yr.
$1.00
.005/6
$.99\frac{1}{6}=\$\frac{5.95}{6}$ pro.
$\$2000\div\frac{5.95}{6}=2000\times\frac{6}{5.95}$
=$2016.81 face (Book wrong)

(7)—(Omit: Not clear as to rate of discount. Interest bearing at 6% and discount not given.)

(8)—$1.00
.045
.045 dis. 1 yr.
$1.00
.01125 dis
.98875 pro.
$20000÷$.98875=$202227.56
(Book wrong.)

(9)—$1—$.015=$.985 pro. on $1
$3500÷$.985=$3553.29 face
∴ he must write his note for $3553.29.

10)—

$150 Grand Rapids, Mich., 5/1/19

Ninety days after date, for value received, I promise to pay to Everett Kellogg, or order, One Hundred Fifty and $\frac{no}{100}$ Dollars with interest at 6%, at the First National Bank of Grand Rapids.

ROBERT CORSON.

)—

$1200.00 Topeka, Kan., Nov. 15, 1919.

Sixty days after date, for value received we, or either of us, promise to pay to the Monroe-Franklin Company or order Twelve Hundred and $\frac{no}{100}$---------------------------Dollars. with interest at 6%, at First National Bank.

FELS & BABBITT.
Per S. M.
Secy. Treas.

$1200 face
.06
72.00 int. 1 yr.
12.00 int. 1/6 yr.
1200.
1212.00 amt.
.04
48.48 dis. 1 yr.
6.38— dis. $\frac{48}{365}$ yr.

Nov. 15 da. left
Dec. 31
Jan. 14 date of mat.
60 time.
Nov. 3 da. left
Dec. 31
Jan. 14
48=$\frac{48}{365}$ yr. term
$1212 amt.
6.38 dis.
$1205.62 proceeds

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)—$400.00 principal
24.00 int. 1 yr. at 6%
$424.00 2nd prin.
25.44 int. 1 yr.
$449.44 3rd prin.
26.97 int. 1 yr.
$476.41 compound amt.

$476.41 amt.
400.00 prin.
$76.41 compound int.

2)—$500.00 principal
25.00 int. 1 yr. at 5%
$525.00 second prin.
26.25 int. 1 yr.
$551.25 third prin.
27.56 int. 1 yr.
$578.81 compound amt.

$578.81 amt.
500.00 prin.
$78.81 int.

(3)—$600.00 principal
24.00 int. 1 yr. at 4%
$624.00 second prin.
24.96 int. 1 yr.
$648.96 third prin.
25.96 int. 1 yr.
$674.92 fourth principal
27.00 int. 1 yr.
$701.92 compound amt.
600.00 prin.
$101.92 compound interest

(4)—$1000.00 prin.
60.00 int. 1 yr. at 6%
$1060.00 second prin.
63.60 int. 1 yr.
$1123.60 third prin.
67.42 int. 1 yr.
$1191.02 fourth prin.
71.46 int. 1 yr.
$1262.48 fifth prin.
75.75 int. 1 yr.
$1338.23 compound amt.
1000.00 prin.
$338.23 compound int.

(5)—$1500.00 prin.
90.00 int. 1 yr. at 6%
$1590.00 second prin.
95.40 int. 1 yr.
$1685.40 third prin.
101.12 int. 1 yr.
$1786.52 fourth prin.
107.19 int. 1 yr.
$1893.71 compound amt.
1500.00 prin.
$393.71 compound int.

(6)—$300.00 prin.
18.00 int. 1 yr.
$318.00 second prin.
19.08 int. 1 yr.
$337.08 third prin.
10.11 int. ½ yr.
$347.19 compound amt.
300.00 prin.
$47.19 compound int.

(7)—$400.00 prin.
20.00 int. 1 yr. at 5%
$420.00 second prin.
21.00 int. 1 yr.
$441.00 third prin.
22.05 int. 1 yr.
$463.05 fourth prin.
7.72 int. ⅓ yr.
$470.77 compound amt.
$400.00 prin.
$70.77 compound int.

(8)—$450.00 prin.
27.00 int 1 yr. at 6%
$477.00 second prin.
28.62 int. 1 yr.
$505.62 third prin.
30.34 int. 1 yr.
$535.96 fourth prin.
16.08 int. ½ yr.
.89 int. 10 da.
$552.93 compound amt.
$450.00 prin.
$102.93 compound int.

(9)—$525.50 prin.
31.53 int. 1 yr.
$557.03 second prin.
33.42 int. 1 yr.
$590.45 third prin .
14.76 int. 5/12 yr.
1.97 int. 1/18 yr.
$607.18 compound amt.
$525.50 prin.
$81.68 compound int.

(10)—$754.50 prin.
45.27 int. 1 yr. at 6%
$799.77 second prin.
47.99 int. 1 yr.
$847.76 third prin.
50.87 int. 1 yr.
$898.63 fourth prin.
11.23 int. 2½ mo. or 5/24 yr.
$909.86 compound amt.
754.50 principal
$155.36 compound int.
(Different from book)

(11)—$1200.00 prin.
18.00 int. ½ yr.
$1218.00 second prin.
18.27 int. ½ yr.
$1236.27 third prin.
18.54 int. ½ yr.
$1254.81 fourth prin.
18.82 int. ½ yr.
$1273.63 fifth prin.
19.10 int. ½ yr.
$1292.73 compound amt.
$1200.00 prin.
$92.73 compound int.

(12)—$450.00 prin.
6.75 int. 1 yr. at 1½%
$456.75 second prin.
6.85 int. 1 yr.
$463.60 third prin.
1.74 int. ¼ yr.
$465.34 compound amt.

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—Amount for 3 yr=1200×$1.191016=$1429.22
Com. int. on 1200 for ½ yr. = 36.00
Com. amt.=$1465.22

—Amount for 4 yr.=1200×$1.262477=$1514.97
Compound int. for ⅓ yr. = 24.00
Com. amt.=$1538.97
1200.00
Com. int.=$ 338.97
(Book wrong)

)—Amount for 5 yr.=1500×$1.276282=$1914.42
Compound int. on 1500 for ½ yr. = 37.50
Com. amt.=$1951.92
1500.00
Com. int.= $451.92

)—Amount for 4 yr.=1500×$1.192519=$1788.78
Com. int. on $1500 for ¾ yr. = 50.62
Amount=$1839.40
1500.00
Com. int.= $339.40

)—Amount for 6 yr.=1500×$1.265319=$1897.98
Com. int. on $1500 for ½ yr. = 30.00
Com. amt.=$1927.98
1500.00
Com. int.= $427.98

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)—Amount for 4 yr.=1875×$1.147523=$2151.61—
Com. int. on 1875 for ¾ yr. = 49.21—
Amount=$2200.82
1875.00
Com. int.= $325.82

)—Amount for 5 yr.=2000×$1.246182=$2492.36
Com. int. on $2000 for ⅓ yr. = 80.00
Com. amt.=$2572.36
2000.00
Com. int.= $572.36

(8)—Amount for 6 yr.=2100×$1.229255=$2581.44—
Com. int. on $2100 for ¼ yr. = 18.37+
Com. amt.=$2599.81
2100.00
Com. int.= $499.81

(9)—Amount for 4 yr.=2400×$1.215506=$2917.21
Int. on $2400 for ⅚ yr. = 100.00
Com. amt.=$3017.21
2400.00
Com. int.= $617.21

(10)—Amt. for 4 yr.=256.50×$1.169859=$300.07
Com. int. on $256.50 for 6½ mo. = 5.56
Com. amt.=$305.63
256.50
Com. int.= $49.13

(11)—Amt. for 5 yr.=350.25×$1.216653=$426.13
Int. on $350.25 for 8 mo. 10 da. = 9.73
Com. amt.=$435.86
350.25
Com. int.= $85.61
(Book wrong)

(12)—Amount for 13 periods=450.80×$1.378511=$621.43
450.80
Com. int.=$170.63

(13)—Amount for 9 periods=565.11×$1.195093=$675.36
Int. for 2 mo. = 3.77
$679.13
565.11
Com. int.=$114.02

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(1)—

Date	Deposit	Withdrawal	Interest	Balance
1918				
March 1	200			200
June 15		50		150
July 1			2	152
July 1	350			502
Aug. 30		75		427
Oct. 15	150			577
Dec. 1		50		527
Jan. 1, '19			8.54	

(2)

Date	Deposit	Withdrawal	Interest	Balance
Jan. 1 1918	200			200.00
Mch. 1	150			350.00
Mch. 10		25		325.00
Apr. 10	200			525.00
Apr. 15		75		450.00
July 1			3.50	453.50
July 10	100			553.50
Aug. 15	190			743.50
Sept. 9		50		693.50
Dec. 10	130			823.50
Jan. 1 191'			7.94	831.44

(3)—

Date	Deposit	Withdrawal	Interest	Balance
1917				
Oct. 5	200			200.00
1918			for 2½ mo.	
Jan. 1	74		1.67	275.67
Feb. 10		100		175.67
Mch. 10	100			275.67
May 5	125			400.67
June 6		100		300.67
July 1			3.51	304.18
Oct. 1	275			579.18
Dec. 10		125		454.18
1919				
Jan. 1			6.08	460.26
	Book not clear. This balance is asked for The rest is not necessary.			
Mch. 1		150		310.26
Apr. 7	350			660.26
June 10	100			760.26
July 1			6.20	766.46

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(1)—Each F. R. Bank @ $4,000,000=
12×$4,000,000=$48,000,000
∴$48,000,000 minimum capital was required .

(2)—$4,000,000 cap.÷$100 par of 1 share=40,000 no. of shares.
∴ each bank had to have 40,000 shares

(3)—$ 22,000,000 capital and surplus
.06
$1,320,000.00 federal stock
∴ The Chicago bank took $1,320,000 worth of Federal Reserve Bank stock.

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(4)—$ 25,000,000 paid-up cap. of N. Y. Bank
51,400,000 surplus
$76,400,000
.06
$4,584,000.00 Federal Bank stock
∴The N. Y. City bank had to take $4,584,000 worth of Federal Reserve Bank stock

(5)—$ 25,000 permitted to 1 co.
8 no. of companies
$200,000
∴ they may own $200,000 worth of stock

(6)—$3,718,955
1,509,871
753,874
912,294
$6,984,994 total earnings
$4,021,677÷$6,894,994=.58+=58%
∴ earnings are $689499 and rate of dividend=58+%

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(1)—Express M. O. for $150=3 ×$.18=$.54
P. O. M. O. for $150=30+$.18=$.48
.06
Note:—Express order in 3 orders of $50 each
P. O. order in 2 orders of $100, $50
∴ Express order costs $.06 more

(2)—Exchange for $12.50 order=$.10
Exchange for 42.00 order= .18
Exchange for 18.75 order= .10
Exchange for 31.05 order= .15
Exchange for 29.00 order= .12
Total=$.65
∴ total fee=$.65

(3)—Cost of $50 M. O. =$.18
Cost of registered letter= .10
$.08
∴ M. O. costs $.08 more

(4)—Cost by Express M. O.=9×.18=$1.62
Cost by registered mail = .10
Saving $1.52
Cost by P. O. M. O.=$1.20+$.18=$1.38
$1.62—$1.38=$.24
∴ If sent by registered mail, $1.52 would be saved and is sent by P. O. M. O., $.24 would be saved.

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(1)

EXCHANGE NATIONAL BANK
Tulsa, Okla., Mch. 6, 1920
Pay to the order of Western Electric Company $116.70
One hundred sixteen and...$\frac{70}{100}$..........Dollars
Void Richard Roe

(2)

UNION NATIONAL BANK
Tulsa, Okla., Mch. 6, 1920
Pay to the order of John M. French & Co. $296.00
Two hundred ninety-six..........Dollars
Richard Roe
Certification across face= Certified
March 6, 1920
John Doe, Cashier

(3)

NATIONAL BANK OF COMMERCE
Tulsa, Okla., Mch. 6, 1920
Pay to the order of Grand Rapids Furniture Co. $2500
Twenty-five hundred..........Dollars
Bass Furniture Co.
Per. R. R.
Indersement on Back
Pay to the order of First
National Bank of Grand Rapids
for Deposit, Grand Rapids
Furniture Co., per J. J.

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Note:—Cost of Draft=face+premium
or Cost of Draft=face—discount

(1)—Cost of draft=$2000+$ .40=$2000.40
(2)—Cost of draft= 2000— .40= 1999.60
(3)—Cost of draft= 3000+ .90= 3000.90
(4)—Cost of draft= 5000— 2.50= 4997.50
(5)—Cost of draft= 4000+ 3.00= 4003.00
(6)—Cost of draft= 1000+ 5.00= 1005.00
(7)—Cost of draft= 1500—11.25= 1488.85
(8)—Cost of draft= 2000— 5.00= 1995.00
(9)—Cost of draft= 3500— .04= 3499.96
(10)—Cost of draft= 6000— .09= 5999.91 (Book wrong).
(11)—Cost of draft= 4500—11.25= 4488.75

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(12)—Cost of draft=$3000+$22.50=$3022.50
(13)—Cost of draft= 4000+3+.50=$4003.50
(14)—Cost of draft=$4000—3+$1=$3998.
(15)—Amt. rec'd by merchant=$4500—$22.50=$4477.50
(16)—He will save 2×$.75 (per $1000)=$1.50
(17)—Cost of draft=$10,000+$5=$10,005
(18)— $12500.00 list price
Less 15% 1875.00 1st discount
10625.00
Less 10% 1062.50 2nd discount
9562.50 net bill or face of draft
Remittance=$9562.50—$47.81=$1514.69 (Book $.01 too much).
(19)—Merchant paid $10,600+$7.95+$22.50=$10,630.25
(20)—Cost of 1st draft=$2700+$ .81=$2700.81
Cost of 2nd draft= 5600— 42.00= 5558.00
Total for both=$8258.81
$2700.00 1st debt
5600.00 2nd debt
$8300.00 total by personal check
8258.81 total by draft
$41.19 saved
∴Total cost was $8258.81 and he saved $41.19 by buying the drafts.

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Ratio is the relation between two numbers of the same kind.

The sign of the ratio is the colon (:)

The first term of the ratio is the antecedent. The second term is the consequent.

The terms may be either concrete or abstract. 4 balls : 8 balls or 4 : 8.

The relation expressed (i. e. the ans.) is always abstract. 3 da. : 6 da.=3/6=½

$$\text{The ralation expressed may be}\begin{cases}\text{a fraction as } 5:6\\ \text{a whole no. as } 10:5\\ \text{a mixed no. as } 7:4=7/4=1\tfrac{3}{4}\end{cases}$$

Note:—Cancellation is shown by italicized figures.
Notice 3 types by *

(1)—*4 : 8=4/8=½ i. e., 4 is ½ of 8.
*8 : 4=8/4=2/1=2 i. e., 8 is 2 times as much as 4.
6 : 12=6/12=½
12 : 6=12/6=2/1
6 : 9 =6/9=⅔
(2)— 8 : 12=8/12=⅔
8 : 16=8/16=½
8 : 20=8/20=⅖
12 : 15=12/15=⅘
12 : 18=12/18=⅔
(3)— 10 : 5=10/5=2/1=2
*10 : 6=10/6=5/3=1 2/3 i. e., 10 is 1 2/3 times as much as 6.
12 : 8 =12/8=3/2=1½
12 : 20=12/20=⅗
16 : 20=16/20=⅘
(4)—16 : 4=16/4=4/1=4
20 : 6=20/6=10/3=3⅓
20 : 5=20/5=4/1=4
20 : 24=20/24=⅚
20 : 30=20/30=⅔
(5)—30 : 45=30/45=⅔
40 : 60=40/60=⅔
45 : 60=45/60=¾
55 : 60=55/60=11/12
24 : 72=24/72=⅓

2
(6)—½ : 3/4=1/*2*×*4* 2/3=2/3 or
½ : 3/4=2/4 : 3/4=2 : 3
½ : 1/3=½×3/1=3/2=1½
2
¼ : 3/8=1/*4*×*8*/3=⅔
2/5 : 4/5=*2*/*5*×*5*/*4*=½
2
⅔ : 7/8=2/3×8/7=16/21

(7)—⅕ : 1/4=1/5×4/1=⅘
2
⅖ : 3/10=2/*5*×*10*/3=1⅓
⅖ : 5/6=2/5×6/5=12/25
2
¾ :5/8=3/*4*×*8*/5×6/5 =1⅕
8
⅚ : 15/16=*5*/*6*×***16***/***15***=8/9
3 3

(8)—.4 : .7=4/10 : 7/10=4/*10*×*10*/7=4/7
.5 : .9=5/10 : 9/10=*5*/*10* ×*10*/9=5/9
5
.15 : .9=***15***/***100***×***10***/*9*=5/30 = ⅙
10 3
.3 : 6=*3*/10×1/*6*=1/20
2
1.5 : 7.5=1.5/7.5=1/5 (div. both terms by 1.5)
(9)—1.25 : 5=5/4 : 5=*5*/4×1/*5*=¼
.05 : .1=5/*100*×*10*/1=5/10=½
10
.75 : 30=*3* 4×1/*30*=1/40
10

100
12.5 : .625=125/10 : 625/1000=*125*/*10*×*1000*/*625*=100/5=20
5

5 4
or 25/2 : 5/8=*25*/*2*×8/*5*=20
.18 : 14.4= 18/100 : 144/10—*18*/*100*×*10*/*144*=1/80

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(1)—(a) First Method.

9
1 First 1st part is 1/4 of *36*=9
9
3 Second 2nd part is 3/4 of *36*=27
∴ 1 : 3=9 : 27=1/3=9/27

In the old book, problems of this kind were given under partitive proportion and the following could be shown:

Total	1st pt.		Total	One pt.
4 :	1	: :	36 :	x

9
(b) Second Method x=1×*36*=9 1st part
4

4 : 3 : : 36 : x
9
x=3×*36*=27 2nd pt.
4

But as they have not had proportion, method (a) should be used.

5
(2)—×1st pt.=4/*9* of *45*=20
5
2nd pt.=5/*9* of *45*=25
9

5
(3)—7 1st pt.=7/*15* of *75*=35
8 2nd pt.=8/*15* of *75*=40
5
15

10
(4)—4 1st pt.=4/*11* of *110*=40
7 10
11 2nd pt.=7/*11* of *110*=70
14
(5)—3 1st pt.=3/*10* of *140*=42
7 14
10 2nd pt.=7/*10* of *140*=98
(6)—5 1st pt.=5/16 of 165=825/16=51 9/16
11
16 2nd pt.=11/16 of 165=1815/16=113 7/16
6
(7)—6 1st pt.=6/*25* of *150*=36
19 6
25 2nd pt.=19/*25* of *150*=114
10
(8)—7 1st pt.=7/*20* of *200*=70
13 10
20 2nd pt.=13/*20* of *200*=130
16
(9)—4 1st pt.=4/*13* of *208*=64
9 16
13 2nd pt.=9/*13* of *208*=144
(10)—6 1st pt.=6/17 of 264=1584/17=93 3/17
11
17 2nd pt.=11/17 of 264=2904/17=170 14/17

(11)—10 1st pt.=10/29 of 324=3240/29=111 21/29
19
29 2nd pt.=19/29 of 324=6156/29=212 8/29
(12)—12 1st pt.=12/41 of 500=6000/41=146 14/41
29
41 2nd pt.=29/41 of 500=14500/41=353 27/41

(1)—60 lb. : 40 lb.=60/40=3/2
∴ there were 3 lb. of the first kind to 2 lb. of the second kind.
(2)—875 lb. : 175 lb.=875/175=5/1
∴ there were 5 lb. of phosphate to 1 lb. of kainit.
(3)—5 cu. yd.=5×27 cu. ft.=135 cu. ft
35 cu. ft. : 135 cu. ft.=35/135=7/27
∴ there were 7 cu. ft. of cement to 27 cu. ft. of crushed stone.
Note:—Both terms must be of the same denomination.

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(4)—2 sulphate 2/9 of the spray=150 lb
7 lime 1/9 of the spray=½ of 150 lb.=75 lb.
9 total 7/9 of the spray=7×75 lb.=525 lb.
∴ 525 lb. of lime were needed.
(5)—8 nitrate of soda 8/13=2500 lb.
5 acid phosphate 1/13=1/8 of 2500 lb.=312.5 lb.
13 total 5/13=5×312.5 lb.=1562.5 lb.
∴ 1562.5 lb. of acid phosphate must be used.
(6)— 9 da. 1st man should pay 9/$\cancel{30}$ of $\overset{2}{\cancel{\$60}}$=$18
21 da. 2nd man should pay 21/$\cancel{30}$ of $\overset{2}{\cancel{\$60}}$=$42
30 da.
(7)—20 cows produce 20×18 lb. of milk=360 lb.
Butter fat=1/$\underset{13}{\cancel{26}}$ of $\overset{180}{\cancel{360}}$ lb.=13 11/13 lb. (Book wrong.)
(8)—$3000 invested by 1st. 1st gets $30\cancel{00}/72\cancel{00}$ of $4800=$2000
4200 invested by 2nd. 2nd gets 42/72 of $4800=$2800
$7200 total
(9)—$2 Child. Child gets 2/7 of $37500=$10714.29—
5 Widow. Widow gets 5/7 of $37500=$26785.71+
$7
(10)—30 tons to 1st 100,000 lbs. : 2000 lbs.=50 no. of tons
20 tons to 2nd, freight on 1 ton=$.60
50 total Freight on 30 tons=30×$.60=$18.00
Freight on 20 tons=20×$.60= 12.00
Total $30.00

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(1)—x : 6=8 : 16
$$x=\frac{\overset{3}{\cancel{6}}\times\cancel{8}}{\underset{2}{\cancel{16}}}=3$$
∴ the unknown term is 3.

(2)—x : 7=4 : 14
$$x=\frac{\cancel{7}\times\overset{2}{\cancel{4}}}{\underset{2}{\cancel{14}}}=2$$

(3)—5 : x=4 : 12
$$x=\frac{5\times\overset{3}{\cancel{12}}}{\cancel{4}}=15$$

(4)—9 : x=8 : 24

$x=\frac{9\times\overset{3}{\cancel{24}}}{\cancel{8}}=27$

(5)—x : 12=10 : 15

$x=\frac{\overset{4}{\cancel{12}}\times\overset{2}{\cancel{10}}}{\underset{5}{\cancel{15}}}=8$

(9)—3/4 : x=2/3 : 5/6

$x=\frac{3/4\times5/6}{2/3}=3/4\times5/6\times3/2=15/16$

(10)—7/8 : 1/9=x : 8/9

$x=\frac{7/8\times8/9}{1/9}=7/8\times8/9\times9/1=7$

(11)—3/5 : 5/8=12/25 : x

$x=5/8\times12/25=\cancel{5}/\underset{2}{\cancel{8}}\times\overset{4}{\cancel{12}}/\underset{5}{\cancel{25}}\times\cancel{5}/\cancel{3}=1/2$

(12)—.2 : x=.15 : .03

$x=\frac{2\times\cancel{.03}}{\underset{5}{\cancel{.15}}}=2/5=.04$

(13)—.5 : 1.5=x : .06

$x=\frac{.5\times.06}{\underset{3}{1.5}}=.06/3=.02$

(6)—10 : x=9 : 12

$x=\frac{10\times12}{9}=40/3=13\ 1/3$

(7)—12 : 18=x : 15

$x=\frac{12\times15}{18}=10$

(8)—x : 2/3=3/4 : 1/2

$x=\frac{2/3\times3/4}{1/2}=$

$\cancel{2}/\cancel{3}\times\overset{1/2}{\underset{2}{\cancel{3/4}}}\times\cancel{2}/\cancel{1}=1$

(14)—x : 2.5=.75 : 6.25

$x=\frac{2.5\times.75}{6.25}=3$

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(1)—5 ch. : 9 ch.=$15 : $x

$x=\frac{9\times\overset{3}{\cancel{15}}}{\cancel{5}}=27$

∴ 9 chains cost $27

(2)—6 books : 10 books : : $21 : $x

$x=\frac{\overset{5}{\cancel{10}}\times\overset{7}{\cancel{21}}}{\underset{3}{\cancel{6}}}=35$

∴ 10 books cost $35

(3)—9 chairs : 15 chairs : : $36 : $x

$x=\frac{15\times\overset{4}{\cancel{36}}}{\cancel{9}}=60$

∴ 15 chairs cost $60

(4)—12 watches : 20 watches : : $96 : $x

$x=\frac{20\times\overset{8}{\cancel{96}}}{\cancel{12}}=160$

∴ 20 watches cost $160

(5)—15 sheets : 48 sheets : : $12 : $x

$x=\frac{48\times\overset{4}{\cancel{12}}}{\underset{5}{\cancel{15}}}=192/5=38.40$

∴ 48 sheets cost $38.40

(6)—18 pairs : 45 pairs : : \$54 : \$x

$$x=\frac{45\times\overset{3}{\cancel{54}}}{\cancel{18}}=135$$

∴ 45 pairs of shoes cost \$135

(7)—20 clocks : 29 clocks=\$110 : \$x

$$x=\frac{29\times 11\cancel{0}}{2\cancel{0}}=319/2=159.50$$

∴ 29 clocks cost \$159.50

(8)—12 pins : 56 pins=\$30 : \$x

$$x:\frac{\overset{28}{\cancel{56}}\times\overset{5}{\cancel{30}}}{\underset{2}{\cancel{12}}}=140$$

∴ 56 pins cost \$140

(9)—15 mattresses : 21 mattresses=\$112.50 : \$x

$$x=\frac{\overset{7}{\cancel{21}}\times\overset{22.50}{\cancel{112.50}}}{\underset{5}{\cancel{15}}}=157.50$$

∴ 21 mattresses cost \$157.50

(10)—11 rugs : 17 rugs=\$412.50 : \$x

$$x=\frac{17\times\overset{37.50}{\cancel{412.50}}}{\cancel{11}}=637.50$$

∴ 17 rugs cost \$637.50

(11)—12 dresses : 23 dresses=\$219 : \$x

$$x=\frac{23\times\overset{73}{\cancel{219}}}{\underset{4}{\cancel{12}}}=1679/4=\$419.75$$

∴ 23 dresses cost \$419.75

(12)—13 bicycles : 27 bicycles=\$327.50 : \$x

$$x=\frac{27\times 327.50}{13}=8842.50/13=680.19+$$

∴ for the second lot he received \$680.19

(13)—8 da. : 13 da.=\$16.80 : \$x

$$x=\frac{13\times\overset{2.10}{\cancel{16.80}}}{\cancel{8}}=27.30$$

∴ he should receive \$27.30

(14)—45 M : 24 M=\$990 : \$x

$$x=\frac{24\times\overset{22}{\cancel{990}}}{\cancel{45}}=528$$

∴ he paid \$528 for the second lot.

(15)—30 min=½ hr.

½ : 4/5=16 min. : x min.

$$x=\frac{5/4\times 16}{\frac{1}{2}}=5/\cancel{4}\times\overset{4}{\cancel{16}}\times 2/1=40$$

∴ in 1 1/4 hrs. the auto runs 40 mi.

(16)—18 cases : 33 cases=\$5.76 : \$x

$$x=\frac{33\times\overset{.32}{\cancel{5.76}}}{\cancel{18}}=10.56$$

∴ *the freight* on 33 cases was \$10.56

(17)—80 tons : 15 tons=$35 : $x
3
x=*15*×35=105/16=6.56¼
80
16
∴ he should charge $6.56

(18) Milk Butterfat
350 lb. : 1000 lb. : : 13.3 lb. :xlb.
20 1.9
x=*1000*×*13.3*=38.0
350
7
∴ there should be 38 lb. of butterfat.

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(19)—5/4 hr. : 55 hr.=250 bolts : x bolts
11
x=55×250=*55*×250×4/*5*=11,000
5/4
∴ the machine will make 11,000 bolts.

(20)—1st rug=9×6×1 sq. ft.= 54 sq. ft.
2nd rug=10×8×1 sq. ft.=80 sq. ft.
54 sq. ft. : 80 sq. ft.=$2.16 : $x
.04
x=80×*2.16*=3.20
54
∴ it will cost $3.20

(21)1st floor=16×12×1 sq .ft.=192 sq. ft.
2nd floor=18×15×1 sq. ft.=270 sq. ft.
Hall floor=18× 9×1 sq. ft.=162 sq. ft.
192 sq. ft. : 432 sq. ft.=$38.40 : $x
.20
x=432×*38.40*=86.40
192
∴ they cost $86.40

(22)—5 qts. : 4 qts.=7 da. : x da .
x=4×7=28/5=5 3/5
5
∴ 80 bu. will last 5 3/5 da.

(23)—100 lb. : 1250 lb. : : 3 lb. : x lb.
x=125*0*×3=375/10=37.5
100
∴ he should feed 37½ lb. of hay
9
100 lb. : 900 lbs.=3 lb. : x lb.
x=*900*×3=27
1*00*
∴ he should feed the second steer 27 lb.

(24)—15 men : 12 men=10 da. : x da.
4 2
x=*12*×*10*=8
15
3
∴ it takes 15 men 8 days

(25)—18 men : 12 men=9 da. : x da.

$$x=\frac{\overset{6}{\cancel{12}}\times\cancel{9}}{\underset{2}{\cancel{18}}}=6$$

∴ it takes 18 men 6 da.

(26)—8 men : 26 men=12 da. : x da.

$$x=\frac{\overset{13}{\cancel{26}}\times\overset{3}{\cancel{12}}}{\underset{2}{\cancel{8}}}=39$$

∴ it takes 8 men 39 da.

(27)—20 hrs. : 30 hrs=32 women : x women

$$x=\frac{\cancel{30}\times\overset{16}{\cancel{32}}}{\cancel{20}}=48$$

∴ it takes 48 women

(28)—27 cows—9 cows=18 cows

18 cows : 27 cows : : 72 da. : x da.

$$x=\frac{27\times\overset{4}{\cancel{72}}}{\cancel{18}}=108$$

∴ the feed will last 108 days

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(29)—75 head+30head=105 head

105 head : 75 head=9 da. : x da.

$$x=\frac{75\times9}{105}=45/7=6\ 3/7$$

∴ the grain will last 6 3/7 days

(30)—50 men—5 men=45 men

45 men : 50 men=25 da. : x da.

$$x=\frac{50\times\overset{5}{\cancel{25}}}{\underset{9}{\cancel{45}}}=250/9=27\ 7/9$$

∴ it takes 45 men 27 7/9 da.

(31)—80 men : 100 men=12 da. : x da.

$$x=\frac{\overset{5}{\cancel{100}}\times\overset{3}{\cancel{12}}}{\underset{\cancel{2}}{\cancel{80}}}=15$$

∴ it takes 80 men 15 da.

(32)—10 da. : 15 da. : : 120 men : x men

$$x=\frac{15\times\cancel{120}}{\cancel{10}}=180$$

180 men—120 men=60 men.

∴ he should employ 60 more men.

(33)—30 da. Nov. 46 cows—10 cows=36 cows.

31 da. Dec. 36 cows : 46 cows=92 da. : x da.

31 da. Jan. $x=\frac{46\times92}{36}=1058/9=117\ 5/9$

92 da.

∴ the feed will last 36 cows 117 5/9 da.

(34)—15 men : 12 men=100 da. :x da.

$$x=\frac{12\times100}{15}=80$$

∴ *it should* take 80 days

(35)—140 da. : 150 da.=30 men : x men
$x=\frac{150\times30}{140}$=225/7=32 1/7 or 33
∴ he needs 33 men per day.

(36)—4 da. : 9 da. : : 30 men : x men
$x=\frac{9\times30}{4}$=135/2=67½ or 68
68 men—30 men=38, no. of additional men.
∴ he must put 68 men to work, but 38 additional men.

(37)—32 da. : 36 da. : : 48 men : x men
$x=\frac{36\times48}{32}$=54
∴ 54 men will do the work in 32 days.

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(1)—26^2=26×26=676
(2)—35^2=35×35=1225
(3)—42^2=42×42=1764
(4)—54^2=54×54=2916
(5)—65^2=65×65=4225
(6)—15^2=15×15=225
(7)—21^2=21×21=441
(8)—25^2=25×25=625
(9)—30^2=30×30=900
(10)—45^2=45×45=2025
(11)—$½^2$=½×½=1/4
(12)—$(2/3)^2$=2/3×2/3=4/9
(13)—$¾^3$=¾×¾×¾=27/64
(14)—$(2/5)^3$=2/5×2/5×2/5= 8/125
(15—$(3/8)^3$=3/8×3/8×3/8= 27/512
(16)—$(2.5)^2$=2.5×2.5=6.25
(17)—$(3.15)^2$=3.15×3.15=9.9225
(18)—$(4.01)^3$=4.01×4.01×4.01= 64.481201
(19)—$(2.15)^2$=2.15×2.15=4.6225
(20)—$(3.25)^3$=3.25×3.25×3.25= 34.328125
(21)—$(15\text{ in})^2$=225 sq. in.
(22)—$(24\text{ in.})^2$=576 sq. in.
(23)—$(30\text{ ft.})^2$=900 sq. ft.
(24)—$(35\text{ ft.})^2$=1225 sq. ft.
(25)—$(42\text{ ft.})^2$=1724 sq. ft.
(26)—$(50\text{ ft.})^2$=2500 sq. ft.
(27)—$(50\text{ yd.})^2$=2500 sq. yd.
(28)—$(50\text{ rd.})^2$=2500 sq. rd.
(29)—$(65\text{ yd.})^2$=4224 sq. yd.
(30)—$(75\text{ rd})^2$=5625 sq. rd.
(31)—$(10\text{ ft. }6\text{ in.})^2=(21/2\text{ ft.})^2$ =441/2 sq. ft.=110.25 sq. ft.
(32)—$(15\text{ ft. }3\text{ in.})^2=(15.25\text{ ft})^2$ =232.5625 sq. ft.
(33)—$(18\text{ ft. }8\text{ in.})^2=(18\ 2/3\text{ ft})^2=(56/3)^2$=3136/9 sq. ft.=348 4/9 sq. ft.
(34)—$(20\text{ ft. }6\text{ in.})^2=(20.5\text{ ft.})^2$ =420.25 sq. ft.
(35)—$(24\text{ ft. }3\text{ in.})^2=24\ 1/4\text{ ft.})^2$ $(24.25\text{ ft.})^2$=588.0625 sq.ft.
(36)—$(10\text{ yd. }1\text{ ft.})^2=(10\ 1/3\text{ yd.})^2=(31/3\text{ yd.})^2$=961/9 sq yd.=106 7/9 sq. yd.
(37)—$12\text{ yd. }2\text{ ft.})^2=(38/3\text{ yd})^2$ =1449/9 sq. yd.=160 4/9 sq. yd.
(38)—$(15\text{ yd. }1\text{ ft.})^2=(15\ 1/3\text{ yd.})^2=(46/3\text{ yd})^2$=2116/9 sq. yd.=235 1/9 sq. yd.
(39)—$(18\text{ yd. }2\text{ ft.})^2=(18\ 2/3\text{ yd.})^2=(56/3\text{ yd.})^2$=3136/9 sq. yd.=348 3/9 sq. yd.
(40)—$(20\text{ yd. }2\text{ ft.})^2=(20\ 2/3\text{ yd.})^2=(6\ 2/3\text{ yd.})^2$= 3844/9 sq. yd.=427 1/9 sq. yds.
(41)—$(6\text{ in.})^3$=216 cu. in.
(42)—$(10\text{ in.})^3$=1000 cu. in.
(43)—$(16\text{ in.})^3$=4096 cu. in.
(44)—$(9\text{ ft.})^3$=729 cu. ft.
(45)—$(12\text{ ft})^3$=1728 cu. ft.
(46)—$(20\text{ ft.})^3$=8000 cu. ft.
(47)—$(1\text{ ft. }6\text{ in.})^3=(3/2\text{ ft.})^3$ =27/8 cu. ft.=3 3/8 cu. ft.
(48)—$(1\text{ ft. }3\text{ in.})^3=(5/4\text{ ft.})^3$ =125/4 cu. ft.=1 61/64 or 1.953125 cu. ft.
(49)—$(2\text{ ft. }6\text{ in.})^3=(5/3\text{ ft.})^3$= 125/8 cu. ft.=15 5/8 or 15.625 cu. ft.
(50)—$(3\text{ ft. }6\text{ in.})^3=(7/2\text{ ft.})^3$= 343/8 cu. ft.=42 7/8 cu. ft.
(51)—$(5\text{ ft. }9\text{ in.})^3=(23/4\text{ ft.})^3$ =12167/64 cu. ft.=190 7/64 cu. ft.
(52)—$(8\text{ ft. }6\text{ in.})^3=(8½\text{ ft.})^3$= $(17/2\text{ ft.})^3$=4913/8 cu. ft. =614 1/8 cu. ft.

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Sq. root by factoring.—Place factors in 2 equal groups.

(1)—$225=5\times5\times3\times3$
$225=(5\times3)\ (5\times3)$
$\sqrt{225}=15$ (i. e. one of the equal groups)

(2)—$324=(3\times3\times2)\ (3\times3\times2)$. So $\sqrt{324}=18$

(3)—$576=(2\times2\times2\times3)\ (2\times2\times2\times3)$ $\sqrt{576}=24$

(4)—3) 729
3) 243
3) 81
3) 27
3) 9
3

$729=(3\times3\times3)\ (3\times3\times3)$
$\sqrt{729}=27$

(5)—$784=(2\times2\times7)\ (2\times2\times7)$
$\sqrt{784}=28$

(6)—$961=31\times31$
$\sqrt{961}=31$

(7)—$1024=(2\times2\times2\times2\times2)\ (2\times2\times2\times2\times2)$
$\sqrt{1024}=32$

(8)—$1089=(3\times11)\ (3\times11)$
$\sqrt{1089}=33$

(9)—$1225=(5\times7)\ (5\times7)$
$\sqrt{1225}=35$

(10)—$1269=(2\times2\times3\times3)\ (2\times2\times3\times3)$
$\sqrt{1296}=36$

(11)—$1764=(2\times3\times7)\ (2\times3\times7)$
$\sqrt{1764}=42$

(12)—$2025=(5\times3\times3)\ (5\times3\times3)$
$\sqrt{2025}=45$

(13)—$2304=(2\times2\times2\times2\times3)\ (2\times2\times2\times2\times3)$
$\sqrt{2304}=48$

(14)—$2500=(5\times5\times2)\ (5\times5\times2)$
$\sqrt{2500}=50$

(15)—$3136=(2\times2\times2\times7)\ (2\times2\times2\times7)$
$\sqrt{3136}=56$

(16)—$4096=(2\times2\times2\times2\times2\times2)\ (2\times2\times2\times2\times2\times2)$
$\sqrt{4096}=64$

(17)—$\sqrt{484}$ sq. ft.=22 ft. ∴ one side measures 22 ft.

(18)—$676=(2\times13)\ (2\times13)$
$\sqrt{676}$ sq. ft.=26 ft.

(19)—$900=(3\times2\times5)\ (3\times2\times5)$
$\sqrt{900}$ sq. ft.=30 ft.

(20)—$961=31\times31$
$\sqrt{961}$ sq. ft.=31 ft.

(21)—$729=(3\times3\times3)\ (3\times3\times3)$
$\sqrt{729}$ sq. yds.=27 yds.

(22)—784=(2×2×7) (2×2×7)
$\sqrt{784}$ sq. yds.=28 yds.
(23)—3025=(5×11) (5×11)
$\sqrt{3025}$ sq. rd.=55 rd.
(24)—4096=(2×2×2×2×2×2) (2×2×2×2×2×2)
$\sqrt{4096}$ sq. rd.=64 sq. rd.

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tens units
(1)— 11'56|3 4
9
64/ 256
256
$\therefore\sqrt{1156}=34$

(2)— 12'25 | 35
9
65/ 325
325
$\therefore\sqrt{1225}=35$

(3)— 18'49 | 43
16
83/ 249
249
$\therefore\sqrt{1849}=43$

(4)— 15'21 | 39
9
78/ 621
621
$\therefore\sqrt{1521}=39$

(5)— 19'36 | 44
16
84/ 336
336
$\therefore\sqrt{1936}=44$

(6)— 17'64 | 42
16
82/ 164
164
$\therefore\sqrt{1764}=42$

(7)— 20'25 | 45
16
85/ 425
425
$\therefore\sqrt{2025}=45$

(8)— 26'01 | 51
25
101/ 101
101
$\therefore\sqrt{2601}=51$

(9)— 29'16 | 54
25
104/ 416
416
$\therefore\sqrt{2916}=54$

(10)— 16'81 | 41
16
81/ 81
81
$\therefore\sqrt{1681}=41$

(11)— 31'36' | 56
25
106/ 636
636
$\therefore\sqrt{3136}=56$

(12)— 34'81 | 59
25
109/ 981
981
$\therefore\sqrt{3481}=59$

(13)— 32'49 | 57
25
107/ 749
749
$\therefore\sqrt{3249}=57$

(14)— 43'56 | 66
36
126/ 756
756
$\therefore\sqrt{4356}=66$

(15)— 40'96 | 64
36
124/ 496
496
$\therefore\sqrt{4096}=64$

(16)— 47'61 | 69
36
129/1161
1161
$\therefore\sqrt{4761}=69$

(17)— 54'76 | 74
49
144/ 576
576
$\therefore\sqrt{5476}=74$

(18)— 51'84 | 72
49
142/ 284
284
$\therefore\sqrt{5184}=72$

(19)— 62'41 | 79
49
149/1341
1341
$\therefore\sqrt{6341}=79$

(20)— 77'44 | 88
64
168/13 44
13 44
$\therefore\sqrt{7744}=88$

(21)— 73'96 | 86
64
166/ 996
996
$\therefore\sqrt{7396}=86$

(22)— 86'49 | 93
81
183/ 549
549
$\therefore\sqrt{8649}=93$

(23)— 94'09 | 97
81
187/1309
1309
$\therefore\sqrt{9409}=97$

(24)— 92'16 | 96
81
186/1116
1116
$\therefore\sqrt{9216}=96$

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(25)— 96'04 | 98
81
188/1504
1504
∴√9604=98

(26)— 1'46'41 | 121
1
22/46
44
241/241
241
∴√14641=121

(27)— 1'82'25 | 135
1
23/82
69
265/1325
1325
∴√18225=135

(28)— 1'61'29 | 127
1
22/61
44
247/1729
1729
∴√16129=127

(29)— 1'53'76 | 124
1
22/53
44
244/976
976
∴√15376=124

(30)— 1'90'44 | 138
1
23/90
69
268/2144
2144
∴√19044=138

(31)— 2'28'01 | 151
1
25/128
125
301/301
301
∴√22801=151

(32)— 2'16'09 | 147
1
24/116
96
287/2009
2009
∴√21609=147

(33)— 2'49'64 | 158
1
25/149
125
308/2464
2464
∴√24864−158

(34)— 3'06'25 | 175
1
27/206
189
345/1725
1725
∴√30625=175

(35)— 2 95'84 | 172
1
27/195
189
342/684
684
∴√29584=172

(36)— 3'27'61 | 181
1
28/227
224
361/361
361
∴√32761=181

(37)— 3'84'16 | 196
1
29/284
261
386/2316
2316
∴√38416=196

(38)— 4'12'09 | 203
4
403/1209
1209
∴√41209=203

(39)— 4'32'64 | 208
4
408/3264
3264
∴√43264=208

(40)— 9'12'04 | 302
9
602/12 04
12 04
∴√91204=302

(41)— 9'30'25 | 305
9
605/30 25
30 25
∴√93025=305

(42)— 9'54'81 | 309
9
609/54 81
54 81
∴√95481=309

(43)— 10'30'41 | 321
9
62/1 30
1 24
641/6 41
6 41
∴√103041=221

(44)— 12'46'09 | 353
9
65/3 46
3 25
703/21 09
21 09
∴√124609=353

(45)— 15'05'44 | 388
9
68/6 05
5 44
768/61 44
61 44
∴√150544=388

(46)— 23'61'96 | 486
16
88/7 61
7 04
966/57 96
57 96
∴√236196=486

(47)— 33'29'29 | 577
25
107/ 8 29
7 49
1147/ 80 29
80 29
$\therefore\sqrt{332929}=577$

(48)— 41'86'09 | 647
36
124/ 5 86
4 96
1287/ 90 09
90 09
$\therefore\sqrt{418609}=647$

(49)— 59'75'29 | 773
49
147/10 75
10 29
1543/ 46 29
46 29
$\therefore\sqrt{597529}=773$

(50)— 78'85'44 | 888
64
168/14 85
13 44
1768/1 41 44
1 41 44
$\therefore\sqrt{788544}=888$

(51)— 80'82'01 | 899
64
169/16 82
15 21
1789/1 61 01
1 61 01
$\therefore\sqrt{808201}=899$

(52)— 95'84'41 | 979
81
187/14 84
13 09
1949/1 75 41
1 75 41
$\therefore\sqrt{958441}=979$

(53)—27'14'41'00 | 5210
25
102/ 2 14

1041/ 10 41
10 41
00
$\therefore\sqrt{27144100}=5210$

(54)—35'64'09'00 | 5970
25
109/10 64
9 81
1187/ 83 09
83 09
00
$\therefore\sqrt{35640900}=5970$

(55)—26'22'46'41 | 5121
25
101/ 1 22
1 01
1022/ 21 46
20 44
10241/ 1 02 41
1 02 41
$\therefore\sqrt{26224641}=5121$

(56)—64'08'00'25 | 8005
64
16005/ 08 0025
8 00 25
$\therefore\sqrt{64080025}=8005$

(57)—81'27'02'25 | 9015
81
1801/ 27 02
18 01
18025/ 9 01 25
9 01 25
$\therefore\sqrt{81270225}=9015$

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Each period in the number whose root is to be found counts. **If the** child can see that .3×.3=.09 he should be able to see that **the** $\sqrt{.09}=.3$

(1)— 26.41'96 | 5.14
25
101/ 1 41
1 01
1024/ 40 96
40 96

(2)— 26'41.96 | 51.4
25
101/ 1 41
1 01
1024/ 40 96
40 96

(3) .26'41'96 | .514
25
101/ 1 41
1 01
1024/ 40 96
40 96

(4)— 29'92.09 | 54.7
25
104/ 4 92
4 16
1087/ 76 09
76 09

(5)— .35'52'16 | .596
25
109/ 10 52
9 81
1186/ 71 16
71 16

(6)— .00'12'96 | .036
9
66/ 3 96
3 96

(7)— .00'07'29 | .027
4
47/ 3 29
3 29

(8)— 30'03.04 | 54.8
25
104/ 5 03
4 16
1088/ 87 04
87 04

(9)— .00'71'74'09 | .0847
64
164/ 7 74
6 56
1687/ 1 18 09
1 18 09

(10)— .00 03'27'61 | .0181
1
28/ 2 27
2 24
361/ 3 61
3 61

(11)— 49'43.49'61 | 70.31
49
1403/ 43 49
42 09
14061/ 1 40 61
1 40 61

(12)— 96.17'72'49 | 9.807
81
188/15 17
15 04
19607/ 13 72 49
13 72 49

(13)— .00'01 36'89 | .0117
1
21/ 36
21
227/ 15 89
15 89

(14)— .00'00'32'49 | .0057
25
107/ 7 49
7 49

(15)— 25'03'00.09 | 500.3
25
10003/ 03 00 09
3 00 09

(16)— 64'03.20'04 | 80.02
64
16002/ 03 20 04
3 20 04

(17)— 1'50.00'00'00 | 12.247+
1
22/ 50
44
242/ 6 00
4 84
2444/ 1 16 00
97 76
24487/ 18 24 00
17 14 09
1 09 91

(18)— 3'25.00'00'00 | 18.027+
1
28/2 25
2 24
3602/ 1 00 00
72 04
36047/ 27 96 00
25 23 29
2 72 71

5'70.00'00'00 | 23.874+
4
43/1 70
1 29
468/41 00
37 44
4767/3 56 00
3 33 69
47744/22 31 00
19 09 76
3 21 24

(20)— 7'91.00'00'00 | 28.124+
4
48/3 91
3 84
561/7 00
5 61
5622/1 39 00
1 12 44
56244/26 56 00
22 49 76
4 06 24

(21)— 12'00.00'00'00 | 34.641+
9
64/3 00
2 56
686/44 00
41 16
6924/2 84 00
2 76 96
69281/7 04 00
6 92 81
11 19

(22)— [illegible] | [illegible]
[illegible]
29/[illegible]
[illegible]
3?2/[illegible]
[illegible]
3?42/[illegible]
[illegible]
3?44?/[illegible]
[illegible]
3?44??/[illegible]
[illegible]
[illegible]

(23)— 3'54'10.00'00'00 | 188.175
1
28/2 54
2 24
368/30 10 (Book wrong)
29 44
3761/66 00
37 61
37627/28 39 00
26 33 89
376345/2 05 11 00
1 88 17 25
16 93 75

(24)— 6'51'17.00'00'00 | 255.180
4
45/2 51
2 25
505/26 17
25 25
5105/92 00
51 05
51028/40 95 00
40 82 24
510360/12 76 00

(25)— 12'4?'??.00'00'00 | ?52.641+
[illegible]
[illegible]
[illegible]
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[illegible]
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[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

(26)— 20′80′70.00′00′00 | 456.146+
16
85/ 4 80
4 25
906/ 55 70
54 36
9121/ 1 34 00
91 21
91224/ 42 79 00
36 48 96
912286/ 6 30 04 00
5 47 37 16
82 66 84

(27)— 1′54.11′80′00 | 12.414+
1
22/ 54
44
244/ 10 11
9 76
2481/ 35 80
24 81
24824/ 10 99 00
9 92 96
1 06 04

(28)— 34′56.77′00′00 | 58.794+
25
108/ 9 56
8 64
1167/ 92 77
81 69
11749/ 11 08 00
10 57 41
117584/ 50 59 00
47 03 36
3 55 64

(29)— .18′76′30 | .433+
16
83/ 2 76
2 49
863/ 27 30
25 89
1 41

(30)— .00′01′77 | .013+
1
23/ 77
69
8

(31)— .51′14′11 | .715+
49
141/ 2 14
1 41
1425/ 73 11
71 25
1 86

(32)— 6′75.40′30′00 | 25.98
4
45/2 75
2 25
509/ 50 40
45 81
5188/ 4 59 30
4 15 04
51968/ 44 26 00
41 57 44
2 68 56

(33)—2/3=.666666+
.66′66′66 | .816+
64
161/ 2 66
1 61
1626/ 1 05 66
97 56
8 10

(34) 3/5=.6
.60′00′00 | .774+
49
147/ 11 00
10 29
1544/ 71 00
61 76
9 24

(35)— 7)5,000,000
.714 285+
.71′42′85 | .845+
64
164/ 7 42
6 56
1685/ 86 85
84 25
2 60

(36)— 8)7,000,000
.875 000
.87'50'00 | .935+
81
183/ 6 50
5 49
1865/ 1 01 00
93 25
7 75

(37)— 12)11.000,000
.916,666+
.91'66'66 | .957+
81
185/ 10 66
9 25
1907/ 1 41 66
1 33 49
8 17
8 17

(38)— 19)15.00'00'00
.78 94 73
.78'94'73 | .888+
64
168/ 14 94
.13 44
1768/ 1 50 73
1 41 44
9 29

(39)— 311)245.000,000 | .787781+
.78'77'81 | .887+
64
168/ 14 77
13 44
1767/ 1 33 81
1 23 69
10 12

(40)—567)410.000,000(.723104+
396 9
13 10
11 34
1 760
1 701
59 0
56 7
2 300
2 268
32
.72'31'04 | .850+
64
165/ 8 31
8 25
1700/ 6 04

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(1)— 46'24 | 68
36
128/10 24
10 24
∴one side of the square=68 ft.

(2)—1 face of the cube=1/6 of 3456 sq in.=576 sq. in.
1 edge=$\sqrt{576}$ sq. in.=24 in.

(3)— 4'35'60.00'00'00 | 208.710+
4
408/ 3560
3264
4167/296 00
291 69
41741/ 4 31 00
4 17 41
417420/ 135 900
∴one side of the field measures 208.710+ ft.

(4)— 1 sq. rd.=272.25 sq. ft.
640 sq. rd=640×272.25 sq. ft.
=174,240 sq. ft.
17'42'40.00'00'00 | 417.420—
16
81/ 1 42
81
827/ 61 40
57 89
8344/ 3 51 00
3 33 76
83482/ 17 24 00
16 69 64
834840/ 54 36 00
1 side=417.420+ ft.
4 sides= 4×417.420+ ft.= 1669.68+ ft.
∴the fence is 1669.68+ ft.

(5)—1 tile$=6\times6\times1$ sq. in.$=36$ sq. in.
14,400 tiles$=14{,}400\times36$ sq. in. $=518{,}400$ sq. in.
518,400 sq. in.$+144$ sq. in. (in 1 sq. ft.)$=3600$ no. of sq. ft.
1 side of the yd.$=\sqrt{3600}$ sq ft. $=60$ ft.
∴the courtyard is 60 ft. by 60 ft.

(6)—640 A.$=1$ sq. mi.
160 A.$=1/4$ sq. mi.
1 side$=\frac{1}{2}$ mi.
4 sides$=4\times\frac{1}{2}$ mi.$=2$ mi.
If he goes 4 mi. per hr. it will take ½ hr. to go 2 mi.

(7)—

```
     1'56'25 | 125
     1
 22/ 56
     44
245  12 25
     12 25
```

1 fence$=125$ ft.
4 fences$=4\times125$ ft.$=500$ ft.
1 ft. cost \$1.25
500 ft. cost $500\times\$1.25=\$625.00$
∴the fence cost \$625.00

(8)—1A.$=160$ sq. rd.
$22\frac{1}{2}$A.$=22\frac{1}{2}\times160$ sq. rd.$=3600$ sq. **rd.**
1 side of the field$=\sqrt{3600}$ sq. rd$=60$ rd.
4 sides$=4\times60$ rd$=240$ rd.
∴they walked 240 rd.

(9)—Area$=160\times90\times1$ sq. ft$=14{,}400$ sq. ft.
1 side of the lot$=\sqrt{14400}$ sq. ft. $=120$ ft.
120 ft. front$=120\times\$40=\$4800$.

(10)—Area$=150\times100\times1$ sq. ft.$=15{,}000$ sq. ft.
1 side of the lot$=\sqrt{15000}$ sq. ft.$=122.474+$ft.

(11)—1000 boys—39 boys $=961$ boys in the square. $\sqrt{961}=31$.
∴there are 31 boys on each side of the square.

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(1)—$H^2=B^2+P^2$
$H^2=16^2+12^2$
$H^2=256+144=400$
$H=\sqrt{400}=20$
∴the hypoteneuse$=20$ in.

(2)—$H^2=B^2+P^2$
$H^2=20^2+15^2$
$H^2=400+225=625$
$H=\sqrt{625}=25$
∴the hypotenuse$=25$ in.

(3)—$H^2=B^2+P^2$
$H^2=24^2+18^2$
$H^2=576+324=900$
$H=\sqrt{900}=30$
∴the hypotenuse$=30$ ft.

(4)—$H^2=B^2+P^2$
$H^2=32^2+24^2$
$H^2=1024+576=1600$
$H=\sqrt{1600}=40$
∴the hypotenuse$=40$ ft.

(5)—$H^2=B^2+P^2$
$H^2=64^2+48^2$
$H^2=4096+2304=6400$
$H=\sqrt{6400}=80$
∴*the hypotenuse*$=80$ ft.

(6)—$H^2=B^2+P^2$
$H^2=12^2+5^2$
$H^2=144+25=169$
$H=\sqrt{169}=13$
∴the hypothenuse$=13$ ft.

(7)—$H^2=B^2+P^2$
$H^2=24^2+10^2$
$H^2=576+100=676$
$H=\sqrt{676}=26$
∴the hypotenuse$=26$ rd.

(8)—$H^2=B^2+P^2$
$H^2=14^2+12^2$
$H^2=196+144=340$
$H=\sqrt{340}=18.439+$
∴ the hypotenues$=18.439+$ ft.

(9)—$H^2=B^2+P^2$
$H^2=30^2+15^2$ **Book Wrong**
$H^2=900+225=1125$
$H=\sqrt{1125}=33.541+$
∴the hypotenuse$=33.54+$ ft.

(10)—$H^2=B^2+P^2$
$H^2=30^2+25^2$
$H^2=900+625=1525$
$H=\sqrt{1525}=39.051+$
∴the hypotenuse$=39.051$

(11)—$H^2=B^2+P^2$
$H^2=75^2+50^2$
$H^2=5625+2500=8125$
$H=\sqrt{8125}=90.137+$
$\therefore$ the hypotenuse $=90.137+$ ft.

(12)—$H^2=B^2+P^2$
$H^2=80^2+75^2$
$H^2=6400+5625=12025$
$H=\sqrt{12025}=109.658+$
$\therefore$ the hypotenuse $=109.658+$ ft.

(13)—$H^2=B^2+P^2$
$H^2=100^2+90^2$
$H^2=10000+8100=18100$
$H=\sqrt{18100}=134.5+$ ft.
$\therefore$ the hypotenuse $=134.5+$ ft.

(14)—$H^2=B^2+P^2$
$H^2=140^2+110^2$
$H^2=19600+12100=31700$
$H=\sqrt{31700}=178.044$ ft.
$\therefore$ the hypotenuse $=178.044$ ft.

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(1)—$H^2=B^2+P^2$
$H^2=10^2+10^2$
$H^2=100+100=200$
$H=\sqrt{200}=14.142+$
$\therefore$ the diagonal $=14.142+$ ft.

(2)—$H^2=B^2+P^2$
$H^2=15^2+15^2$
$H^2=225+225=450$
$H=\sqrt{450}=21.213$
$\therefore$ the diagonal $=21.213+$ ft.

(3)—$H^2=B^2+P^2$
$H^2=30^2+30^2$
$H^2=900+900=1800$
$H=\sqrt{1800}=42.426$
$\therefore$ the diagonal $=42.426+$ ft.

(4)—$H^2=B^2+P^2$ (Book
$H^2=50^2+50^2=$ wrong)
$H^2=2500+2500=5000$
$H=\sqrt{5000}=70.71+$ ft.
$\therefore$ the diagonal $=70.71+$ ft.

(5)—$H^2=B^2+P^2$
$H^2=40^2+40^2$
$H^2=1600+1600=3200$
$H=\sqrt{3200}=56.568+$
$\therefore$ the diagonal $=56.568+$ rd.
(Book wrong)

(6)—$H^2=B^2+P^2$
$H^2=65^2+65^2$
$H^2=4225+4225=8450$
$H=\sqrt{8450}=91.923$
$\therefore$ the diagonal $=91.923+$ rd.

(7)—$H^2=B^2+P^2$
$H^2=90^2+90^2$
$H^2=8100+8100=16200$
$H=\sqrt{16200}=127.279+$
$\therefore$ the diagonal $=127.279+$ yd.

(8)—$H^2=100^2+100^2$
$H^2=10,000+10,000=20,000$
$H=\sqrt{20,000}=141.421+$
$\therefore$ the diagonal $=141.421+$ yd.
(Book wrong)

(9)—$H^2=B^2+P^2$
$H^2=15^2+10^2$
$H^2=225+100=325$
$H=\sqrt{325}=18.027+$
$\therefore$ the diagonal $=18.027+$ ft.

(10)—$H^2=B^2+P^2$
$H^2=20^2+12^2$
$H^2=400+144=544$
$H=\sqrt{544}=23.323+$
$\therefore$ the diagonal $=23.323+$ ft.

(11)—$H^2=B^2+P^2$
$H^2=30^2+12^2$
$H^2=900+144=1044$
$H=\sqrt{1044}=32.310+$
$\therefore$ the diagonal $=32.310$ yd.

(12)—$H^2=B^2+P^2$
$H^2=40^2+15^2$
$H^2=1600+225=1825$
$H=\sqrt{1825}=42.720+$
$\therefore$ the diagonal $=42.720+$ yd.

(13)—$H^2=2500+900=3400$
$H=\sqrt{3400}=58.309+$
$\therefore$ the diagonal $=58.309+$ yd.

(14)—$H^2=10,000+4225=14,225$
$H=\sqrt{14225}=119.268+$
$\therefore$ the diagonal $=119.268+$ rd.

(1)—$B^2=H^2-P^2$
$B^2=12^2-9^2$
$B^2=144-81=63$
$B=\sqrt{63}=7.93$
$\therefore$ the other leg of the tri. $=7.93$ ft.

(2)—$B^2=H^2-P^2$
$B^2=20^2-15^2$
$B^2=400-225=175$
$B=\sqrt{175}=13.22+$
$\therefore$ the other leg $=13.22$ ft.

(3)—$B^2=H^2-P^2$

$B^2=45^2-30^2$

$B^2=2025-900=1125$

$B=\sqrt{1125}=33.54+$

∴the other leg=33.54+ ft.

(4)—$B^2=H^2-P^2$

$B^2=15^2-10^2$

$B^2=225-100=125$

$B=\sqrt{125}=11.18+$

∴the other leg=11.18+yd.

(5)—$B^2=H^2-P^2$

$B^2=24^2-20^2$

$B^2=576-400=176$

$B=\sqrt{176}=13.266+$

∴the other leg=13.266+ rd.

(6)—$B^2=H^2-P^2$

$B^2=45^2-36^2$

$B^2=2025-1296=729$

$B=\sqrt{729}=27$

∴the other leg=27 yd.

(7)—$B^2=H^2-P^2$

$B^2=75^2-60^2$

$B^2=5625-3600=2025$

$B=\sqrt{2025}=45$

∴the other leg=45 ft.

(8)—$B^2=H^2-P^2$

$B^2=90^2-80^2$

$B^2=8100-6400=1700$

$B=\sqrt{1700}=41.23+$

∴the other leg=41.23+ ft.

(9)—$B^2=H^2-P^2$

$B^2=100^2-60^2$

$B^2=10,000-3600=6400$

$B=\sqrt{6400}=80$

∴the other leg=80

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(1)—$H^2=B^2+P^2$

$H^2=12^2+9^2$

$H^2=144+81=225$

$H=\sqrt{225}=15$

∴ the diagonal of the rug=15 ft.

(2)—$H=9+6$

$H=81+36=117$

$H=\sqrt{117}=10.807+$

∴diagonal of the rug=10.807 ft.

(3)—$H^2=B^2+P^2$

$H^2=90^2+67.5^2$

$H^2=8100+4556.25=12656.25$

$H=\sqrt{12656.25}=112.5$

90 rd.+67.5 rd=157.5 rd.

∴the father walked 157.5 rd. and the son walked 112.5 rd.

(4)—$H^2=B^2+P^2$

$H^2=160^2+120^2$

$H^2=25,600+14,400=40,000$

$H=\sqrt{40,000}=200$

160′+120′+200′=480′

480 ft.@ \$1.10=480×\$1.1

\$528

∴the curb cost \$528

(5)—$H^2=B^2+P^2$

$H^2=180^2+80^2$

$H''=32,400+6400=38,800$

$H=\sqrt{38,800}=196.977+$

∴he swims 196.977 ft.

(6)—$H^2=B^2+P^2$

$H^2=24^2+18^2$

$H^2=576+324=900$

$H=\sqrt{900}=30$ diag. of flo

$H^2=30^2+10^2$

$H^2=900+100=1000$

$H=\sqrt{1000}=31.622+$

∴longest straight line in room=31.662+ ft.

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(7)—$B^2=H^2-P^2$

$B^2=20^2-16^2$

$B^2=400-256=144$

$B=\sqrt{144}=12$

∴the foot of the ladder is 12 ft. from the wall

(8)—7×20 mi=140 mi. Jones

7×28 mi=196 mi. Brown

$H^2=B^2+P^2$

$H^2=196^2+140^2$

$H^2=38,416+19,600=58,0$

$H=\sqrt{58016}=240.865+$

∴they are 240.865+ mi. apart

(9)—$H^2=B^2+P^2$
$H^2=15^2+6^2$ 15′=½ width (of bldg.
$H^2=225+36=261$
$H=\sqrt{261}=16.155+$
16.155+ ft.+1 ft. (overhang)
=17.155 or about 17 ft. 2 in.
∴ the carpenter must cut the rafter 17 ft. 2 in. long.

(10)—$H^2=B^2+P^2$
$H^2=12^2+9^2$
$H^2=144+81=225$
$H=\sqrt{225}=15$
12 steps=12×15″=180 in.= 15 ft.
∴ the stringer must be 15 ft. long

(11)—$B^2=H^2—P^2$
$B^2=90^2—65^2$
$B^2=8100—4225=3875$
$B=\sqrt{3875}=62.249+$
65′—20′=45
$B^2=H^2—F^2$
$B^2=60^2—45^2$
$B^2=3600—2025=1575$
$B=\sqrt{1575}=39.686+$
∴ the distance =101.935 ft.
(Book wrong)

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(Note—In the following solutions Italic figures indicate cancellation.)

(1)—3.1416× 15 in.= 47.124*0* in.
(2)—3.1416× 20 in.= 62.832*0* in.
(3)—3.1416× 42 in.=131.9472 in.
(4)—3.1416× 34 ft.=106.8144 ft.
(5)—3.1416× 27 rd.= 84.8232 rd.
(6)—3.1416× 2.7 in.= 84.48232 in.
(7)—3.1416× 3.7 ft.= 11.62392 ft.
(8)—3.1416× 5.8 ft.= 18.22128 ft. (Book wrong)
(9)—3.1416× 9.2 yd.= 28.90272 yd.
(10)—3.1416× 8.5 rd.= 26.7036*0* rd.
(11)—3.1416× 21.4 ft.= 67.2304 ft.
(12)—3.1416× 13.5 yd.=42.41160 yd. (Book wrong)
(13)—3.1416× 20.5 yd.= 64.40280 yd.
(14)—3.1416× 31.4 rd.= 98.64624 rd. (Book wrong)
(15)—3.1416× 5.25 rd.= 16.4934*00* rd.
(16)—3.1416× 5.12 yd.= 16.084992 yr.
(17)—3.1416× 3.08 rd.= 9.676128 rd.
(18)—3.1416× 1.75 yd.= 5.4978*00* yd.
(19)—3.1416× 50.9 rd.= 159.90744 rd.
(20)—3.1416× 150.5 yd.= 472.[illegible] yd.
(21)—3.1416× 10 [illegible]
(22)—3.1416× [illegible]
(23)—3.1416× [illegible]
(24)—3.1416× [illegible]
(25)—[illegible]
(26)—[illegible]
(27)—[illegible]
(28)—[illegible]
(29)—[illegible]
(30)—[illegible]
(31)—[illegible]
(32)—[illegible]
(33)—[illegible]

(34)—$\frac{22}{7}\times\overset{4}{\cancel{28}}$ in.= 88 in.

(35)—$\frac{22}{7}\times\overset{5}{\cancel{35}}$ in.=110 in.

(36)—$\frac{22}{7}\times 42.5$ in.$=\frac{935.0}{7}=133.5\ 5/7$ in.

(37)—$\frac{22}{7}\times 25.1$ ft.$=\frac{552.2}{7}=78.\ 6/7$ ft.

(38)—$\frac{22}{7}\times\overset{5.4}{\cancel{37.8}}$ yd.=118.8 yd.

(39)—$\frac{22}{7}\times 142$ ft.$=\frac{3124}{7}=446\ 2/7$ ft.

(40)—$\frac{22}{7}\times 253$ yd.$=\frac{5566}{7}=795\ 1/7$ yd.

(41)—$\frac{22}{7}\times\overset{6.5}{\cancel{45.5}}$ yd.=143 yd.

(42)—$\frac{22}{7}\times\overset{.062}{\cancel{.434}}$ ft.=1.364 ft.

(43)—$\frac{22}{7}\times 604$ yd.$=\frac{22.88}{7}=3.26\ 6/7$ yd.

(44)—$\frac{22}{7}\times 11.42$ rd.$=\frac{251.24}{7}=35.89\ 1/7$ rd.

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(Area of circle=22/7×R^2)

(1)—Area of circle=22/7×49 sq. in.=154 sq. in.
(2)—Area of circle=22/7×100 sq. in.=314 2/7 sq. in.
(3)—Area of circle=22/7×196 sq. in.=616 sq. in.
(4)—Area of circle=22/7×441 sq. in=1386 sq. in.
(5)—Area of circle=22/7×900 sq. in.=2828 4/7 sq. in.
(6)—Area of circle=22/7×59.29 sq. in.=186.34 sq. in.
(7)—Area of circle=22/7×31.36 sq. in.=98.56 sq. in.
(8)—Area of circle=22/7×18.49 sq. in.=58.11 1/7 sq. in.
(9)—Area of circle=22/7×16384 sq. in.=51492 4/7 sq. in. (Bool
(10)—Area of circle=22/7×22201 sq. in.=69774 4/7 sq. in. wrong
(11)—Area of circle=22/7×.0196 sq. ft.=.0616 sq. ft.
(12)—Area of circle=22/7×7.84 sq. ft.=24.64 sq. ft.
(13)—Area of circle=22/7×82.81 sq. ft.=260.26 sq. ft.
(14)—Area of circle=22/7×216.09 sq. in.=679.14 sq. in.
(15)—Area of circle=22/7×44100 sq. in.=138.600 sq. in.
(16)—Area of circle=22/7×625. sq. ft.=137.50/7=19.64 2/7 sq. ft.
(17)—Area of circle=22/7×28.09 sq. ft.=617.98/7=88.28 2/7 sq. ft.
(18)—Area of circle=22/7×37.21 sq. ft.=116.94 4/7 sq. ft.
(19)—Area of circle=22/7×67.24 sq. ft.=211.32 4/7 sq. ft.
(20)—Area of circle=22/7×96.04 sq. ft.=301.84 sq. ft.

Area of circle=3.1416×R^2 (Using decimal for relation).

(21)—Area of circle=3.1416×144 sq. in=452.3904 sq. ft.
(22)—Area of circle=3.1416×256 sq. in.=804.2496 sq. in.
(23)—Area of circle=3.1416×784 sq. in.=2463.0144 sq. in.
(24)—Area of circle=3.1416×1024 sq. in.=3216.9984 sq. in.
(25)—Area of circle=3.1416×961 sq. ft.=3019.0776 sq. ft.
(26)—Area of circle=3.1416×17.64 sq. ft.=55.417824 sq. ft.
(27)—Area of circle=3.1416×26.01 sq. ft.=81.713016 sq. ft.

(28)—Area of circle =3.1416×53.29 sq. ft.=167.415864 sq. ft.
R=½ Diameter. Take R and then square it.
(29)—Area of circle=3.1416×36 sq. in.=113.0976 sq. in (Book
(30)—Area of circle=3.1416×81 sq. in.=254.4696 sq. in. wrong)
(31)—Area of circle=3.1416×49 sq. ft=153.9384 sq. ft.
(32)—Area of circle=3.1416×361/4 sq. ft.=283.5294 sq. ft.
(33)—Area of circle=3.1416×15.21 sq. ft.=47.783736 sq. ft.
(34)—Area of circle=3.1416×8.1225 sq. ft.=25.517646 sq. ft.
(35)—Area of circle=3.1416×930.25 sq. yd.=2922.4734 sq. yd.
(36)—Area of circle=3.1416×17.64 sq. yd.=55.417824 sq. yd.
(37)—Area of circle=3.1416×225/4 sq. in.=176.715 sq. in.
(38)—Area of circle=3.1416×25 sq. in.=78.54 sq. in.
(39)—Area of bottom of basin=3.1416×4.41 sq. ft.=13.854456 sq. ft.
(40)—Area of bottom of pond=3.1416×506.25 sq. ft.=1590.435 sq. ft.
(41)—Area of piston head=3.1416×100 sq. in.=314.16 sq. in.=
(21.8+ sq. ft.
(42)—Area of big circle=3.1416×256 sq. ft.=804.2496 sq. ft.
Area of little circle=3.1416×100 sq. ft.=314.16 sq. ft.
804.2496 sq. ft.—314.16 sq. ft.=490.0896÷2=245.0448 sq. ft.
∴the paving=245.0448 sq. ft.

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(1)—Areea of rectangle=b×alt.×unit of measure.
Area of rectangle=60×50×1 sq. ft.=3000 sq. ft.
Area of triangle=$\frac{40\times50\times1}{2}$ sq. ft.=1000 sq. ft.
3000 sq. ft.+1000 sq. ft.=4000 sq. ft. total.
$\frac{4000\times\$240}{43560}=\frac{8000}{363}=\$22.04$ (Book wrong).
∴the value of the plot=$22.04

(2)—Area of rectangle=40×40×1 sq. yd.=1600 sq. yd.
Area of triangle=$\frac{20\times40\times1}{2}$ sq. rd.=400 sq. rd.
Area of other triangle=$\frac{10\times40\times1}{2}$ sq. rd.=200 sq. rd.
Total area=1600 sq. rd.+400 sq. rd.+200 sq. rd.=2200 sq. rd.
160 sq. rd.=1 acre.
2200 sq. rd.=$\frac{2200}{160}=\frac{55}{4}$=13¾ acres.
13¾ A.@$4000=$\frac{55}{4}\times\$4000=\$55{,}000$
∴the lot is worth $55,000.

(3)—Area of lot=400×300×1 sq. ft.=120,000 sq. ft.=$\frac{120{,}000}{43{,}560}$ A.=
$\frac{120000}{43560}$@$16,000=$44,077.13+
∴100+300′+6′=406′ length.
Area of walk=$\frac{406\times6\times1\text{ sq. ft.}}{9\text{ sq. ft.}}=\frac{812}{3}$=270 2/3 sq. rd.
(Book wrong)
270 2/3 sq. rd.@$1.40=$\frac{812}{3}\times\$1.40=\frac{1136.80}{3}$=$378.93 1/3
∴the walk cost $378.93

(5)—2 lengths=2×500×12×1 sq. ft.=12,000 sq. ft.
Area of big circle=3.1416×2500 sq. ft.=7854 sq. ft.
Area of little circle=3.1416×1444 sq. ft =4536.4704 sq. ft
Circular part of track=3317.5296 sq. ft.
3317.5296 sq. ft.+12,000 sq. ft.=15,317.5296 sq. ft=1701.9477 1/
(sq. yd
1701.9477 sq. yd.@$0.80=$1361.56 (Book wrong
∴the track cost $1361.56.

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Volume of cylinder=area of base×alt.×unit of measure
(1)—Volume of cylinder=8×10×1 cu. in.=80 cu. in.
(2)—Volume of cylinder=10×12×1 cu. in.=120 cu. in.
(3)—Volume of cylinder=12×12×1 cu. in.=144 cu. in.
(4)—Volume of cylinder=8×16×1 cu. in.=128 cu. in.
(5)—Volume of cylinder=30×24×1 cu. in.=720 cu. in.
(6)—Volume of cylinder=35×48×1 cu. in.=1680 cu. in.
(7)—Volume of cylinder=24×66×1 cu. in.=1584 cu. in.
(8)—Volume of cylinder=15×30×1 cu. in.=450 cu. in.
(9)—Volume of cylinder=4.2×40×1 cu. in.=168 cu. in.
(10)—Volume of cylinder=6.75×69×1 cu. in.=465.75 cu. in.
(11—Volume of cylinder=4×25/3×1 cu. ft.=33 1/3 cu. ft.
(12)—Volume of cylinder=5 24/144×9½×1 cu. ft.=31/6×9/12 cu. ft.=49 1/12 cu. ft.
(13)—Volume of cylinder=6 72/144×10 2/3×1 cu. ft.=13/2×32/3× 1 cu. ft.=69 1/3 cu. ft.
(14)—Volume of cylinder=7 96/144×14 5/6×1 cu. ft.=23/3×89/6 ×1 cu. ft.=113.72+ cu. ft.
(15)—Volume of cylinder=3.1416×25×14×1 cu. in.=1099.56 cu. in.
(16)—Volume of cylinder=3.1416×81×16×1 cu. in.=4071.51+ cu. in.
(17)—Volume of cylinder=3.1416×16×24×1 cu. in.=1206.3744 cu. in.
(18)—Volume of cylinder=3.1416×4×12×1 cu. ft.=150.7968 cu. ft.
(19)—Volume of cylinder=3.1416×9×20×1 cu. ft.=565.488 cu. ft.
(20)—Volume of cylinder=3.1416×9×22×1 cu. ft.=622.0368 cu. ft.
(21)—Volume of cylinder=3.1416×16/9×7/2×1 cu. ft.=19.54+ cu. ft.
(22)—Volume of cylinder=3.1416×81/16×17/4×1 cu. ft.=67.593+ cu. ft.
(23)—Volume of cylinder=3.1416×69/4×19/3×1 cu. ft.=141.488+ cu. ft.
(24)—Volume of cylinder=3.1416×1369/144×15/2×1 cu. ft.=224.002625 cu. ft.
(25)—Volume of cylinder=3.1416×81/4×25/3×1 cu. ft.=530.145
(26)—Volume of cylinder=3.1416×529/16×21/2×1 cu. ft.=1090.626075 cu. ft.

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Capacity of silo=area of base×alt.×unit of measure.
(1)—Capacity of silo=3.1416×25×20×1 cu. ft.=1570.8 cu. ft.
(2)—Capacity of silo=3.1416×25×24×1 cu. ft.=1884.96 cu. ft.
(3)—Capacity of silo=3.1416×36×24×1 cu. ft.=2714.3424 cu. ft.
(4)—Capacity of silo=3.1416×36×30×1 cu. ft.=3392.928 cu. ft.
(5)—Capacity of silo=3.1416×225/4×24×1 cu. ft.=4241.16 cu. ft.
(6)—Capacity of silo=3.1416×64×30×1 cu. ft.=6031.872 cu. ft.
300 cu. ft.÷50 cu. ft. (per ton)=6=number of tons for each cow.

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)—12 cows require 12×6 tons=72 tons.
)—15 cows require 15×6 tons=90 tons.
9)—20 cows require 20×6 tons=120 tons.
10)—25 cows require 25×6 tons=150 tons.
11)—35 cows require 35×6 tons=210 tons.
12)—45 cows require 45×6 tons=270 tons.
(13)—50 cows require 50×6 tons=300 tons.
(14)—65 cows require 65×6 tons=390 tons.

Volume of silage= area of base×alt.×unit of measure.

(15)—Volume of silage=3.1416×121/4×21×1 cu. ft.=1995.7014 cu. ft.
8 cows require per day 8×3/2 cu. ft.=12 cu. ft.
1995.7014 cu. ft.÷12 cu. ft.=166.3+ number of days.
∴the silage will feed 8 cows 166.3 days.

(16)—Volume of silage=3.1416×36×20×1 cu. ft.=2261.952 cu. ft.
10 cows require per day10×3/2 cu. ft.=15 cu. ft.
2161.952 cu. ft.÷15 cu. ft.=150.8+ number of days.
∴the silage will feed 10 cows 150.8 days.

(17)—Volume of silage=3.1416×225/4×24×1 cu. ft.=4241.16 cu. ft.
16 cows require 16×3/2 cu. ft.=24 cu. ft. per day.
4241.16÷24=176.715=176.7+ number of days.
∴the silage will feed 16 cows 176.7 days.

(18)—Volume of silage=3.1416×225/4×25×1 cu. ft=4417.875 cu. ft.
20 cows require 20×3/2 cu. ft.=30 cu. ft. per day.
4417.875 cu. ft.÷30 cu. ft.=147.2625=147.2+ number of days.
∴the silage will feed 20 cows 147.2 days.

(19)—Volume of silage=3.1416×64×27×1 cu. ft.=5428.6848 cu. ft.
28 cows require 28×3/2 cu. ft.=42 cu. ft. per day.
5428.6848 cu. ft.÷42 cu. ft.=129.2544=129.3— number of days.
∴the silage will feed 28 cows 129.3— days.

(20)—Nov. 30 days 36 cows require 36×166×5/4 cu. ft.=7470 cu.ft.
Dec. 31 days 7470 cu. ft.÷50 cu. ft.=149.4 number of tons.
Jan. 31 days ∴he must provide 149.4 tons.
Feb. 28 days
Mch. 31 days
Apr. 15 days
166 days

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1 gallon=231 cu. in.
(1)—12 gallons=12×231 cu. in.=2772 cu. in.
(2)—19 gallons=19×231 cu. in.=4389 cu. in.
(3)—35 gallons=35×231 cu. in.=8085 cu. in.
1 bu.=2150.42 cu. in.
(4)—25 bu.=25×2150.42 cu. in.=53,760.5 cu. in.
(5)—32 bu.=32×2150.42 cu. in.=68,813.4 cu. in.
(6)—45 bu.×2150.42 cu. in.=96,768.9 cu. in.
1 barrel=21/5 cu. ft.
(7)—45 barrels=45×21/5 cu. ft.=189 cu. ft.
(8)—64 barrels=64×21/5 cu. ft.=268.8 cu. ft.
(9)—120 barrels=120×21/5 cu. ft.=504 cu. ft.
7.5 gal.=1 cu. ft. (approximate).
(10)—110 gal.=110÷7.5=14.66+ or 14.7 number of cu. ft.
(11)—165 gal.=165÷7.5=22 number of cu. ft.

(12)—210 gal.=210÷7.5=28 number of cu. ft.
1 cu. ft.=7.5 gallons.

(13)—45 cu. ft.=45×7.5 gal.=337.5 gal.

(14)—70 cu. ft.=70×7.5 gal.=525 gal.

(15)—91 cu. ft.=91×7.5 gal.=682.5 gal.
231 cu. in.=1 gal.

(16)—1155 cu. in.÷231 cu. in.=5 number of gallons.

(17)—1386 cu. in.÷231 cu. in.=6 number of gallons.

(18)—16170 cu. in.÷231 cu. in.=70 number of gallons.
1 cu. ft. of water=62.5 lbs.

(19)—15 cu. ft. of water=15×62.5 lbs.=937.5 lbs.
1 gal. of water=25/3 lbs.

(20)—15 gal. of water=15×25/3 lbs.=125 lbs.
1 cu. ft.=125/2 lbs.
1 bbl. of water=21/5 cu. ft.

(21)—12 bbl. then=12×21/5×125/2 lbs.=3150 lbs.

(22)—Capacity of bin=96×60×48×1 cu. in.=276,480 cu. in.
276,480 cu. in.÷2150.42 cu. in.=128.5+ number of bushels.

(23)—Bin=$\frac{120\times60\times36\times1\text{ cu. in.}}{2150.42\text{ cu. in.}}$=120.5+ number of bushels.

(24)—Bin=$\frac{120\times72\times60\times1\text{ cu. in.}}{2150.42\text{ cu in.}}$=241.0+ number of bushels.

(25)—Bin=$\frac{144\times96\times72\times1\text{ cu. in.}}{2150.42\text{ cu. in.}}$=462.8+ number of bushels.

(26)—Bin=$\frac{144\times120\times84\times1\text{ cu. in.}}{2150.42\text{ cu. in.}}$=674.9+ number of bushels.

(27)—Bin=$\frac{192\times144\times120\times1\text{ cu. in.}}{2150.42\text{ cu. in.}}$=1542.8+ number of bushels. (Book wrong)

(28)—Tank=6×5×4×1 cu. ft.=120 cu. ft.
1 cu. ft.=7.5 gal.
120 cu ft.=120×7.5 gal.=900 gal.

(29)—Tank=10×6×4×1 cu. ft.=240 cu. ft.
240 cu. ft.=240×7.5 gal.=1800 gal.

(30)—Tank=12×8×6×1 cu. ft.=576 cu. ft.
576 cu. ft.=576×7.5 gal.=4320 gal.

(31)—Tank=16×6×4×1 cu. ft.=384 cu. ft.
384 cu. ft.=384×7.5 gal.=2880 gal.

(32)—Tank=16×12×7×1 cu. ft.=1344 cu. ft.
1344 cu. ft.=1344×7.5 gal.=10,080 gal.

(33)—Tank=20×8×11×1 cu. ft.=1760 cu. ft.
1760 cu. ft.=1760×7.5 gal.=13,200 gal.
4.2 cu. ft.=1 bbl. (as per table page 173).

(34)—Tank=$\frac{8\times6\times4\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=45.7+ number of bbls.

(35)—Tank=$\frac{10\times7\times5\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=83.3+ number of bbls.

(36)—Tank=$\frac{12\times7\times6\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=120 bbls. **(Book wrong)**

(37)—Tank=$\frac{14\times8\times6\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=160 number of bbls. **(Book wrong)**

(38)—Tank=$\frac{18\times12\times8\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=411.4 number of bbls. **(Book wrong)**

(39)—Tank=$\frac{24\times16\times12\times1\text{ cu. ft.}}{4.2\text{ cu. ft.}}$=1097.1 number of bbls. **(Book wrong)**

(40)—1 bu.=2150.42 cu. in.=$\frac{2150.42}{1728}$ cu. ft.

12 bu.=$12\times\frac{2150.42}{1728}$ cu. ft.=14.93+ cu. ft.

(41)—28 bu.=$28\times\frac{2150.42}{1728}$ cu. ft.=34.84+ cu. ft.

(42)—45 bu.=$\frac{45\times 2150.42}{1728}$ cu. ft.=56.00+ cu. ft. (Book wrong)

(43)—65 bu.=$\frac{65\times 2150.42}{1728}$ cu. ft.=80.88+ cu. ft.

(44)—72 bu.=$\frac{72\times 2150.42}{1728}$ cu. ft.=89.60+ cu. ft. (Book wrong)

(45)—100 bu.=$\frac{100\times 2150.42}{1728}$ cu. ft.=124.44+ cu. ft.

(46)—120 bu.=$\frac{120\times 2150.42}{1728}$ cu. ft.=149.33+ cu. ft. (Book wrong)

(47)—250 bu.=$\frac{250\times 2150.42}{1728}$ cu. ft.=311.11+ cu. ft.

(48)—360 bu.=$\frac{360\times 2150.41}{1728}$ cu. ft.=448.0+ cu. ft. (Book wrong)

(49)—525 bu.=$\frac{525\times 2150.42}{1728}$ cu. ft.=653.333+ cu. ft.

(50)—Tank=$\frac{17}{2}\times\frac{21}{4}\times\frac{5}{2}\times 1$ cu. ft.=$\frac{1785}{16}$ cu. ft.

$\frac{1785}{16}$ cu. ft.=$\frac{1785}{16}\times 62.5$ lbs.=6972.6 lbs.

(51)—Tank=$\frac{31}{3}\times\frac{77}{12}\times\frac{43}{12}\times 1$ cu. ft.=$\frac{102641}{432}$ cu. ft.

$\frac{102641}{432}$ cu. ft.=$\frac{102641}{432}\times 62.5$ lb.=14,849.681— lb. (Book wrong)

(52)—Tank=$16\times\frac{21}{2}\times\frac{20}{3}\times 1$ cu. ft.=1120 cu. ft.

1120 cu. ft.=1120×62.5 lbs.=70,000 lbs.

(53)—Tank=$\frac{49}{2}\times\frac{63}{4}\times\frac{35}{6}\times 1$ cu. ft.=$\frac{108045}{48}$ cu. ft.

$\frac{108045}{48}$ cu. ft.=$\frac{108045}{48}\times 62.5$ lbs.=140,683.59+ lbs.

(54)—Volume of tank=$3.1416\times\frac{9}{4}\times 6\times\frac{15}{2}$ gal.=318.087 number of gal.

(55)—Volume of tank=$3.1416\times 4\times 7\times\frac{15}{2}$ gal.=659.736 gal.

(56)—Volume of tank=$3.1416\times\frac{25}{4}\times 8\times\frac{15}{2}$ gal.=1178.1 gal.

(57)—Volume of tank=$3.1416\times 4\times 9\times\frac{15}{2}$ gal.=848.23+ gal.

(58)—Volume of tank=$3.1416\times 25\times 12\times\frac{15}{2}$ gal.=7068.6 gal.

(59)—Volume of tank=$3.1416\times 36\times 14\times\frac{15}{2}$ gal.=11,875.248+ gal. (Book wrong)

(60)—Volume of tank$=3.1416\times 81\times 15\times \frac{15}{2}$ gal.$=28627.83$ gal.

(61)—Volume of tank$=3.1416\times 100\times 16\times \frac{15}{2}$ gal.$=37699.2$ gal.

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(1) February 1, 1919
RECEIVED OF John Brown
Twenty-five and no/100............DOLLARS
On account.
$25.00 Clara Smith.

(2) February 1, 1919
RECEIVED OF Mary Jones
Three and no/100............DOLLARS
For club dues.
$3.00 Mabel Brown.

(3) Feb. 1, 1919
RECEIVED OF James Nolan
Twenty-five and no/100............DOLLARS
For services.
$25.00 Mabel Brown.

(4) Feb. 1, 1919
RECEIVED OF Chas. Brown
Forty and no/100............DOLLARS
For rent of No. 324 Wilson Ave., for Feb. 1919.
$40.00 Mabel Brown.

(5) Feb. 1, 1919
RECEIVED OF John Jones
Twenty and no/100............DOLLARS
To apply on account.
$20.00 Mabel Brown.

(6) Feb. 1, 1919
RECEIVED OF Mark Jones
Fifty and no/100............DOLLARS
For bicycle.
Mabel Brown.

(7) Feb. 2, 1919
RECEIVED OF John Brown
Seventy-five and no/100............DOLLARS
In full of account.
$75.00 West Side Grocery
Per C. M.

(8) Feb. 2, 1919
RECEIVED OF James Jones
Fifteen and no/100............DOLLARS
For rent of No. 616 W. 15th.
15.00 Thos. Evans.

(9) Feb. 2, 1919
RECEIVED OF Wm. Smith
Thirty-five and no/100............DOLLARS
For service.
$35.00 Jones Motor Co.

(10) Feb. 2, 1919
RECEIVED OF............
Twenty and no/100............DOLLARS
In full of account.
$20.00 West Side Grocery.

(11) Feb. 1, 1919
RECEIVED OF……………………………………………………………………
Ten and no/100……………………………………………………DOLLARS
To apply on account.
$10.00 King's Meat Market
Per J. D.

(12) Jan. 1, 1920
RECEIVED OF John Jones
Seventy-five and no/100……………………………………DOLLARS
For rent of No. 375 W. 9th.
$75.00 Tom Brown.

(13) March 5, 1919
RECEIVED OF James Jones
Ten and no/100……………………………………………………DOLLARS
To apply on suit.
$10.00 Brown & Co., Tailors.

(14) Feb. 1, 1919
RECEIVED OF Mrs. John Thomas
Five and no/100……………………………………………………DOLLARS
For 10th installment on player-piano.
$5.00 Brunswick Piano Co.
Per C. M.

PAGE 184

Notice table in book.

(1)—$ .08 cost of 1st lb. in zone 5
.06 cost of each add. lb.
$ .14 cost of package
∴ it will cost $.14.
07 cost of 1st lb. in zone 4
11½×4c= .46 cost of additional lbs.
$ .53
∴ it cost $.53.

(3)—$ .06 cost of 1st lb. in zone 3
.08 cost of add. lb
$ .14 total
Exchange Postal
30c—14c=16c
∴ Parcel post charge will be 16c less. (Book wrong).

(4)—$ .07 cost of 1st lb. in zone 4
.08 cost of add. lbs.
$ .15 per package
10×$.15=$1.50 cost of 10 pkgs.
$ .07 cost of 1st lb.
.18 cost of add. lbs.
$ .25 per pkg.
8×$.25=$2.00 cost of 8 pkgs.
$1.50+$2=$3.50
∴ the total cost was $3.50.

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(1)—$1600 face of policy
.01
$16.00 premium

(2)—$1800 face
.01½
18.00
9.00
$27.00 premium

(3)—$2000 face
.01⅓
6.66⅔
20.00
$26.66⅔=$26.67 premium

(4)— $2500 face
.01¼
6.25
25.00
$31.25 premium

(5)—$4500 face
.01¾
33.75
45.00
$78.75 premium

(6)— $7500 face
.02¼
18.75
150.00
$168.75 premium

(7)—$10,000 face
.01¼
25.00
100.00
$125.00 premium

(8)—$12,000 face
.02½
60.00
240.00
$300.00 premium

(9)—$20,000 face
.02½
100.00
400.00
$500.00 premium

(10)—$35,000 face
.02¾
26250
70000
$962.50 premium

(11)—$40,000 face
.02½
200.00
800.00
$10,000 premium

(12)—$56,000 face
.01¾
42000
56000
$980.00 premium

(13)—$4.500 face
.015
22500
4500
$67.500 premium

(14)—$12,250 face
.017
85750
12250
$208.250 premium

(15)—$15000 face
.031
15000
45000
$465.00 premium

(16)—$20,000 face
.025
100000
40000
$500.000 premium

(17)—$30000 face
.016
180000
30000
$480.00 premium

(18)—$35,000 face
.025
175000
70000
$875.000 premium

(19)—Premium= 80×$ .40=$32.
(20)—Premium= 90×$ .60=$54.
(21)—Premium= 94×$.75=$70.50.
(22)—Premium= 96×$ .90=$86.40.
(25)—Premium=200×$1.50=$300.
(24)—Premium=125×$1.12=$140.
(25)Premium=200×$1.50=$300.
(26)—Premium=240×$1.35=$324.
(27)—Premium=210×$1.05=$220.50.
(28)—Premium=250×$1.10=$275 .
(29)—Premium=300×$1.20=$360.
(30)—Premium=375×$2.25=$843.75.

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(1)—Premium=30×$ .60=$18.00.
(2)—Premium=25×$ .60=$15.
(3)—Premium=25×$ .45=$11.25.
(4)—60c—45c=15c increase.
15½ : 45c=15/45=⅓=.33⅓=33⅓%.
∴ the increase was 33⅓%.
(5)—$240÷$2=120 no. of hundreds.
120×$100=$12000 face of policy.
(6)—⅔ of $12000=$8000 face of policy.
Premium=80×$ .45=$36.
1 yrs. premium=⅓ of $36=$12.
∴ premium per yr.=$12.
(7)—1¾%—1¼%=½%.
$4000 policy
.00½
$20.00 difference in premium.
(8)—¾ of $20,000=$15000 face of policy.
$15000 face
.02
300.00 annual premium.
5
$1500 premium for 5 yrs.
$15000 face
1500 premium
$13500 saved
∴ $13,500 amt. saved.
(9)—Premium=250×$10.35=$2587.50
$2587.50÷5=$517.50 premium received by each co.
∴ each co. received $517.50 premium .

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Notice Table

(1)—Premium= 2×$20.14=$40.28
(2)—Premium= 3× 45.03=$144.09
(3)—Premium= 5× 22.85=$114.25
(4)—Premium= 8× 30.07=$240.56
(5)—Premium=10× 48.71=$487.10
(6)—Premium= 5× 36.17=$180.85
(7)—Premium= 2× 47.54=$95.08
(8)—Premium= 3× 30.94=$92.82
(9)—Premium= 3× 22.85=$68.55
(10)—Premium= 3× 48.71=$146.13
(11)—Premium=10× 45.69=$456.90
(12)—Premium=15× 40.34=$605.10
(14)—Premium=12× 44.70=$536.40

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(15)—(Omit)
(16)—Premium=20×3×$48.03=$2881.80
$4157 received by policy holder
2881.80 received by co.
$1275.20 excess paid to policy holder.
∴ the excess was $1275.20.

(17)—Pre. on 1st policy=20×3×$48.71=$2922.60
Pre. on 2nd policy=20×5× 49.75= 4975
total= 7897.60
$8000 rec'd.
7897.60 paid out
102.40 excess
2350 accrued interest
$2452.40 profit
∴ he rec'd $102.40 excess and a profit of $2452.40 .

(18)—Paid in=14×10×$41.60=$5824
14 yr.+13 yr.+12 yr.+11 yr.+10 yr. etc.
1 yr=105 no. yrs. int.
$41.60 pre. on $1000
10
416.00 pre. on 10000 per yr.
.04
16.64 int. 1 yr.
105×$16.64=$1747.20 total interest.
$1747.20 int.
5824. paid out
7571.20 amt. that the girls would have rec'd if the money had been at interest.
$10000 rec'd by them from ins. co.
7571.20
$2428.80 diff.
∴ they rec'd $2428.80 more than if the money had been at int.

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(1)—3 mills on $1=$.003
$1200 assessed value
.003
$3.600 tax

(2)—$1800 value
.0035
9000
5400
$6.3000 tax

(3)$2400 value
.004
$9.600 tax

(4)—$3500 value
.004
$14.000 tax

(5)—$4000 value
.003
$12.000 tax

(6)—$5000 value
.001¼
1250
5000
$6.250 tax

(7)—$7500 assessed value
.001½
3750
7500
$11.250 tax

(8)—$12000 value
.002½
6000
24000
$30.000 tax

(9)—$15000 value
.003¼
3750
45000
$48.750 tax

(10)—$20000 value
.004½
10000
80000
$90.000 tax

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(1)—$1.50÷$1000=.0015=1½ mills rate
(2)—3÷1500=.002=2 mills rate

(3)—4.16÷1800=.002 14/45=2 14/45 mills rate (Book wrong)
(4)—$6÷$2000=.003=3 mills rate
(5)—8.25÷2750=.003=3 mills rate
(6)—12.50÷5000=.002½=2½ mills rate
(7)—30÷8000=.003¾=3¾ mills rate
(8)—50.40÷12000=.004¼=4¼ mills rate
(9)—74÷18500=.004=4 mills rate
(10)—66÷20000=.003 3/10=3 3/10 mills rate

(1)—Total tax÷tax on $1=assessed value
$12÷$.003=$4000 valuation
(2)—15÷.003=5000 valuation
(3)—20÷.002=10,000 valuation
(4)—18.75÷.0025=7500 valuation
(5)—22.50÷.005=4500
(6)—110÷.0022=50,000 valuation
(8)—137.40÷.003=458,000 valuation
(9)—162.50÷.0038=427,763.16 valuation
(10)—171.04÷.0032=53450 valuation

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(1)—Tax on $700=$1.155
Tax on 50= .083
Tax on 750= 1.238=$1.24

(2)—Tax on $800=$1.320
Tax on 20= .033
Tax on 5= .009
Tax on 825= 1.362=$1.36

(3)—Tax on $800=$1.320
Tax on 60= .099
Tax on 860= 1.419=$1.42

(4)—Tax on $900=$1.485
Tax on 40= .066
Tax on 5= .009
Tax on 945= 1.560

(5)—Tax on $900=$1.485
Tax on 80= .132
Tax on 5= .009
Tax on 985= 1.626=$1.63

(6)—Tax on $1000=$1.65
Tax on 200= .33
Tax on 1200= 1.98

(7)—Tax on $1000=$1.65
Tax on 400= .66
Tax on 50= .083
Tax on 1450= 2.393

(8)—Tan on $1000=$1.65
Tax on 800= 1.32
Tax on 90= .149
Tax on 1890= 3.119=$3.12

(9)—Tax on $2000=$3.30
Tax on 100= .165
Tax on 2100= 3.465=$3.47

(10)—Tan on $2000=$3.30
Tax on 400= .66
Tax on 2400= 3.96

(11)—Tax on $3000=$4.95
Tax on 500= .825
Tax on 3500= 5.775=$5.78

(12)—Tan on $3000=$4.95
Tax on 900= 1.485
Tax on 3900= 6.435=$6.44

(13)—Tax on $4000=$6.60
Tax on 200= .33
Tax on 50= .083
Tax on 4250= 7.013=$7.01

(14)—Tan on $4000=$6.60
Tax on 600= .99
Tax on 4600= 7.59

(15)—Tax on $4000=$6.60
Tax on 800= 1.32
Tax on 20= .033
Tax on 5= .009
Tax on 4825=7.962=$7.96

(16)—Tax on $5000=$8.25
Tax on 600= .99
Tax on 5600= 9.24

(17)—Tax on $6000=$9.90
Tax on 200= .33
Tax on 50= .083
Tax on 6250=10.313=10.31

(18)—Tax on $7000=$11.55
Tax on 500= .825
Tax on 7500= 12.375=12.38

(19)—Tax on \$8000=\$13.20
Tax on 700= 1.155
Tax on 20= .033
Tax on 5= .009
Tax on 8725= 14.397=14.40

(20)—Tax on \$9000=\$14.85
Tax on 400= .66
Tax on 50= .083
Tax on 9450= 15.593=15.5

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(1)—Tax÷Assessed Value=Rate of Tax
\$3500÷1,400,000=.002½=2½ mills rate
∴ the tax rate was 2½ mills.
(2)—\$4500÷\$1,350,000=.003⅓=3⅓ mills rate
∴ the tax rate needed is .003⅓ mills

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(3)—\$16000—\$4000=\$12000 tax to be raised
\$12000÷\$2,700,000=.004 4/9=4 4/9 mills
∴a tax rate of 4 4/9 mills is required
(4)—\$6750—\$950=\$5800 property tax
\$5800÷\$1,450,000=.004 mills
∴ tax rate should be 4 mills
(5)—\$15000 value
.004
60.000 Mr. Johnson't tax
\$6750÷\$1,450,000=.004 19/29=4 19/29 mills rate of poll tax
\$15000×.004 19/29=69.827=\$69.83
∴his tax was \$60 and would have been \$69.83 if there had bee
poll tax. (Book wrong in last part).
(6)—\$28500÷\$2,157,500=.0132=13.2 mills
\$12500 value
.0132
25000
37500
12500
\$165.0000 tax
∴ the rate is 13.2 mills and Mr. Raymond pays \$165.
(7)—\$28500—(125+\$7250)=\$20000 needed.
\$20,000÷\$2157500=.0092+=9.2 mills
\$12500 value
.0092
25000
112500
\$115.0000 Mr. Raymond's tax
(9)—\$15000 valuation
.003½
7500
45000
\$52.500 property tax
2.00 poll tax
\$54.50 total tax in town where he resides
(9)—\$11500 valuation
.003½
5750
34500
\$40.25 property tax
\$54.50+\$40.25=\$94.75 total tax
∴ his total tax is \$94.75

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(10)—$300000 total estate
175000 to widow
125000 to son and 2 daughters
$175000
.02
$3500.00 tax on widow's share
$125000
.01
$1250.00 tax on son and 2 daughters
$3500+$1250=$4750 total tax

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(1)—$4000 cost of house
2700 cash
1300 loan
$1300 face of note
.06
78.00 annual interest
∴ his annual int. payment was $78.

(2)—$500 loan
.05
25.00 annual int. paid out
$3000 savings bank
.04
120.00 int. per yr.
$25 int. paid out+$100 repairs=$125 annual expense.
$360 rent—$120 in. on $3000=$240 net cost per yr.
$240—$125=$115 gain.
∴ he gained $115 per yr.

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(1)—$45.00 market value
.15 com.
45.15 cost of 1 share
100
$4515.00 total cost of 100 shares
∴ 100 Erie cost $4515.

(2)—100 Long Island cost 100×$24.15=$2415.
(3)—200 Atchison cost 200×($95+.15)=$19.030.
(4)—200 D & H cost 200×$150.00=$30,040.
(5)—200 Reading cost 200×$82.65=$16,530
(6)—250 Am. Sugar cost 250×$118.15=$29,537.50
(7)—100 Pa. cost 100×$39.65=$5965
(8)—200 Woolworth cost 200×$112.40=$22,480
(9)—300 Ten. copper cost 300×$57.90=$17,370
(10)—250 Gen. Elec. cost 250×($175.375—$.20)=$43,893.75
(11)—400 Lehigh Valley cost 400×$82.275=$32,910.000
(12)—300 N. Y. Central cost 300×$101.65=$30,495.00
(13)—250 O & W cost 250×$29.40=$7350
(14)—300 Studebaker cost 300×$152.95=$45,885.00
(15)—300 Beth. Steel cost 300×$345.45=$103,635.00
(16)—350 C. F. & I. cost 350×($47.875—$.15)=$16,808.75
(17)—350 Elec. Storage cost 350×$60.275=$21096.25
(18)—400 Am. Tobacco cost 400×$211.95=$84,780.00
(19)—450 Beet Sugar cost 450×$66.525=$29,926.25
(20)—500 Westinghouse cost 500×$68.025=$34,012.50
(21)—600 Ill. Central cost 600×$106.40=$63,840.00

(22)—1000 Erie cost 1000×$44.775=$44,775
(23)—1000 Can. Pacific cost 1000×$181.575=$181,575.
(24)—2000 Am. Loco. cost 2000×$71.025=$142,050

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(1)—100×.15=$15. 100×$81=$8100—$15=$8085.
(2)—100×.20=$20. 100×$167=16,700—$20=$16,680.
(3)—100×.15=$15. 100×$18.50=$1850—$15=$1835.
(4)—100×.20=$20. 100×$185=$18,500—$20=$18,480
(5)—200×.15=$30. 200×$30.87½=$6175—$30=$6145.
(6)—200×.15=$30. 200×$35.25=$7050—$30=$7020.
(7)—150×.15=$22.50. $150×$68.50=$10,275—$22.50=$10,252.50.
(8)—200×.15=$30. 200×$46.50=$9300—$30=$9270.
(9)—250×.15=$37.50. 250×$23.62½=$5906.25—$37.50=$5868.75.
(10)—200×.20=$40. 200×$150.50=$30,100—$40=$30.060.
(11)—300×.15=$45. 300×$81.75=$24.525—$45=$24,480.
(12)—350×.15=$52.50. 350×$72,50=$25.375—$52.50=$25,322.50
(13)—400×.20=$80. 400×$140.25=$56,100—$80=$56,020.
(14)—400×.15=$60. 400×$15.87½=$6350—$60=$6290.
(15)—500×.15=$75. 500×$13.25=$6625—$75=$6550.
(16)—450×.15=$67.50. 450×$42.50=$19,125—$67.50=$19,057.50.
(17)—550×.15=$82.50. 550×$80 =$44,000—$82.50=$43,917.50.
(18)—600×.15=$90. 600×$101.25=$60,750—$90=$60,660.
(19)—700×.15=$105. 700×$106.50=$74,550—$105=$74,445.
(20)—800×.15=$120. 800×$59.37½=$47,500—$120=$47,380.
(21)—1000×.15=$150. 1000×$52.25=$52,250—$150=$52,100.
(22)—2000×.15=$300. 2000×$80.25=$160,500—$300=$160,200.
(23)—3000×.15=$450. 3000×$116.25=$348,750—$450=$348,300.
(24)—2500×.20=$500. 2500×$150.37½=$375,937.50—$500=
($375,437.50.

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Note:—In each problem add the commission to the market price.

(1)—10 Am. Ice cost 10×$24.15=$241.50
(2)—20 B. R. T. cost 20×$86.40=$1728.
(3)—30 D & H cost 30×$150.45=$4513.50
(4)—50 Erie cost 50×$27.65=$1382.50
(5)—75 Woolworth cost 75×$104.65=$7848.75
(6)—80 U. S. Steel cost 80×$70.775=$5662.
(7)—100 Can. Pac. cost 100×$145.70=$14,570.
(8)—100 Westinghouse cost 100×$112.65=$11,265.
(9)—100 Leh. Val. cost 100×$143.70=$14,370.
(10)—100 Penn. cost 100×$108.025=$10,802.50
(11)—100 Tex. & Pac. cost 100×$14.40=$1440.
(12)—150 Reading cost 150×$150.075=$22511.25 (Book wrong).
(13)—200 Pullman cost 200×$152.20=$30,440.

Note:—Net Amt. for 1 share=Market Price—Com.
From 14th the Amt. received is to be found instead of the cost.
Net Amt. from

(14)—20 Central Lea.=20×$42.85=$857.
(15)—Net amt. from 40 N. Y. C.=40×$90.475=$3619.
(16)—Net amt. from 50 D & H=50×$150.05=$7502.50
(17)—Net amt. from 75×L. & N.=75×$11.85=$8388.75
(18)—Net amt. from 100 Mo. Pac.=100×$2.675=$267.50
(19)—Net amt. from 100 N. Y. C.=100×$104.35=$10,435.
(20)—Net amt. from 100 Woolworth=100×$90.475=$9047.50

(21)—Net amt. from 200 Erie=200×$27.35=$5470.
(22)—Net amt. from 300 Reading=300×$149.675=$44902.50
(23)—Net amt. from 500 N. Y. C.=500×$90,475=$45,237.50
(24)—Net amt. from 1000 U. S. Steel=1000×$70.475=$70475.
(25)—Net amt. from 1000 Baldwin=1000×$80.60=$80,600.
(26)—Net amt. from 1500 Third Ave.=1500×$51.10=$76,650

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Market price corn
(1)—$121.375—$ .15=$121.225 net from 1 share
107.875— .15= 108.025 entire cost of 1
13.200 profit on 1
Profit on 50 Penn.=50×$13.20=$660.
(2)—$85.50 —$ .15=$85.35 net from 1 share
70.625— .15= 70.775 cost of 1 share
14.575 profit from 1 share
Profit from 50 Steel=50×$14.575=$728.75
(3)—$149.875+$ .20=$150.075 cost of 1 share
82.75 — .15= 82.60 net from 1 share
67.475 loss on 1 share
Loss on 100 Reading=100×$67.475=$6747.50
(4)—$25.75—$ .15=$25.60 net from 1 share
24.00+ .15= 24.15 cost of 1 share
1.45 profit on 1 share
Profit on 100 Ice=100×$1.45=$145.
(5)—$121.375—$ .15=$121.225 net from 1 share
107.875+ .15= 108.025 cost of 1 share
13.200 profit on 1 share
Profit on 100 Penn.=100×$13.20=$1320.
(6)—$143.50+$ .20=$143.70 cost of 1 share
80.50— .15= 80.35 net from 1 share
63.35 loss from 1 share
Loss on 100 L. V.=100×$63.35=$6335.
(7)—$150.25+$ .20=$150.45 cost of 1 share
141.50— .20= 141.30 net from 1 share
9.15 loss on 1 share
Loss on 200 D & H=200×$9.15=$1830.
(8)—$112.50+$ .15=$112.65 cost of 1 share
68.75— .15= 68.60 net of 1 share
44.05 loss on 1 share
Loss on 100 Westinghouse=100×$44.05=$4405.
(9)—$102.25 —$ .15=$102.10 net from 1 share
90.625+ .15= 90.775 cost of 1 share
11.325 profit on 1 share
Profit on 300 N. Y. C.=300×$11.325=$3397.50
(10)—$89.50—$ .15=$89.35 net on 1 share
86.25+ .15× 86.40 cost of 1 share
2.95 profit on 1 share
Profit on 300 B. R. T.=300×$2.95=$885.
(11)—$160.25—$ .20=$160.05 net on 1 share
152.00+ .20= 152.20 cost of 1 share
7.85 profit on 1 share
Profit on 500Pullman=500×$7.85=$3925.

(12)—$36.25+$ .15=$36.40 cost of 1 share
33.00— .15= 32.85 net of 1 share
3.55 loss on 1 share
Loss on 800 Pac. Mail=800×$3.55=$2840.

(13)—$85.50 —$ .15=$85.35 net from 1 share
70.625+ .15= 70.775 cost of 1 share
14.575 profit on 1 share
Profit on 900 Steel=900×$14.575=$13,117.50

(14)—$43.50—$ .15=$43.35 net from 1 share
27.50+ .15= 27.65 cost of 1 share
14.70 profit of 1 share
Profit on 1000 Erie=1000×$14.70=$14,700.

(15)—$120.875—$ .15=$120.725 net from 1 share
112.00 + .15= 112.15 cost of 1 share
8.575 profit on 1 share
Profit on 1000 L & N=1000×$8.575=$8575.

(16)—$120.00—$ .15=$119.85 net of 1 share
80.75+ .15= 80.90 cost of 1 share
38.95 profit on 1 share
Profit on 1000 Baldwin=1000×$38.95=$38,950

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(1)—$120.875+$.15=$121.025 cost of 1 share
$6050÷$121.025=49, no. shares and surplus of $119.775

(2)—$25.75+$.15=$25.90 cost of 1 Am. Ice
$57,175÷$25.96=2207, no. of shares and a surplus of $13.70

(3)—$62.625+$.15=$62.775 cost of 1 Third Ave.
$675÷$62.775=99, no. of shares with a surplus of $60.275

(4)—$85.50+$.15=$85.65 cost of 1 Steel
$17125÷$85.65=199, no. of shares with a surplus of $80.65

(5)—$102.25+$.15=$102.40 cost of 1 N. Y. C.
$41000÷$102.40=400, no. of shares and surplus of $40.

(6)—$42.50+$.15=$42.65 cost of 1 Erie
$12000÷$42.65=281 shares and surplus of $15.35

(7)—$141.50+$.20=$141.70 cost of 1 D & H
$12000÷$141.70=84 shares with surplus of $97.20
(Book wrong. Used 15c com.)

(8)—$82.75+$.15=$82.90 cost of 1 Reading
$14500÷$82.90=174 shares and surplus of $75.40

(9)—$68.75+$.15=$68.90 cost of 1 Westinghouse
$16000÷$68.90=232 shares and surplus of $15.20

(10)—$113+$.15=$113.15 cost of 1 Woolworth
$20000÷$113.15=176 shares and surplus of $85.60

(11)—$104.125+$.15=$104.275 cost of 1 U. S. 4
$21000÷$104.275=201 shares and $40.725 surplus

(12—$78.375+$.15=$78.525 cost of 1 Medvale Steel 4
$15,700÷$78.525=199 shares and $73.525 surplus

(13)—Net amt. of 300 shares of Erie=300×$35.475=$10642.50
$105.125+$.15=$105.275 cost of 1 U. S. Steel 4
$10642.50÷105.275=101 shares and 9.725 surplus.

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Note:—A 6% bond draws 6% of the par value. 6% of $100=$6.

(1)—$100×.06=$6÷$90=6 2/3%.
(2)—$100×.06=$6÷$120=5%.
(3)—$100×.06=$6÷$150=4%.
(4)—$100×.06=$6÷$125=4 4/5%.

(5)—$100×.06=$6÷$105=5 5/7%.
(6)—$100×.05=$5÷$90=5 5/9%.
(7)—$100×.04½=$4.50÷$90=5%.
(8)—$100×.05½=$5.50÷$110=5%.
(9)—$100×.05 1/8=$5.12½÷$125=4.1%.
(10)—$100×.06=$6÷$121.50=4.93%.
(11)—$100×.07=$7÷$140=5%.
(12)—$100×.07=$7÷$125=5 3/5%.
(13)—$100×.04=$4÷$84.50=4.73%.
(14)—$100×.05=$5÷$115.50=4.32%.
(15)—$100×.04½=$4.50÷$121.75=3.69%.

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(16)—$5 : $140=5/140=1/28=3 4/7% rate on investment
4 : 120=4/120=1/30=3⅓% rate on investment
3 4/7%=3.57%
3 1/3%=3.33—%
.24% diff.
∴ 1st is 24% better.
(17)—5 : 125=5/125=1/25=.04=4%
4 : 100=4/100=.04=4%
∴ rate = same
(18)—120 shares sold for 120×$100=$12000
12000÷75=160 shares of 4% stock
Income from 1st=120×$5=$600
Income from 2nd=160×$4=$640
$640—$600=$40 gain. (Book wrong).
(19)—200 shares sold for 200×$90=$18000
$18000÷$75=240 no. shares bought
Income from 2nd=240×$5=$1200
Income from 1st=200×$4= 800
400 gain
∴ Gain = $400. (Book wrong).
(20)—1st brings 150×$7=$1050
2nd brings 200×$4= 800
1st is 250 better
7 : 90=7/90=7.77%
4 : 85=4/85=4.70%
3.07%
∴ 1st is .25% better.
(21)—100 shares brings 100×$4=$400
4 : 50.15=4/50.15=.0797—=7.97%
∴ income was $400 or 7.97% on investment.
(22)—500×$15=$43,500
$42500÷$100=425 no. shares
500×$4=$2000 div. on 1st investment
425×$5=$2125 div. on 2nd investment
$2125—$2000=$125 gain in income.
$4 : $85=4/85=.047—=4.7% rate on investment
$5 : $100=5/100=.05=5% rate on investment
5%—4.7%=3% dif. in rate
∴ the gain was $125 and the rate of gain was .3%. (Book wrong)
(23)—$5 : $90=5/90 =.055=5.5% rate on investment
$6 : $125=6/125=.048=4.8% rate on investment
.7% diff. in rate
$22500÷$90=250 no. shares of 1st kind
250×$5=1250 dividend from 1st kind

$22500÷$125=180 no. of shares of 2nd kind
180×$6=$1080 dividend from 2nd kind
$1250—$1080=$170 dif, in money
∴ 1st is $170 better investment.

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(1)—Rent=.20 or 1/5 of $1200=$240
Food=.35×$1200= 420
Clothing=.15×$1200= 180
Miscel.=.25×$1200= 300
Savings=.05×$1200= 60

(2)—Rent=.20×$1500= $300
Food=.35×$1500= 525
Clothing=.15×$1500= 225
Miscel.=.25×$1500= 375
Savings=.05×$1500= 75

(3)—Rent=.20×$1600= $320
Food=.35×$1600= 560
Clothing=.15×$1600= 240
Miscel.=.25×$1600= 400
Savings=.05×$1600= 80

(4)—Rent=.20×$1800= $360
Food=.30×$1800= 540
Clothing=.15×$1800= 270
Miscel.=.25×$1800= 450
Savings=.10×$1800= 180

(5)—Rent=.20×$1300= $260
Food=.35×$1300= 455
Clothing=.15×$1300= 195
Miscel.=.25×$1300= 325
Savings=.05×$1300= 65

(6)—Rent=.20×$1400= $280
Food=.35×$1400= 490
Clothing=.15×$1400= 210
Miscel.=.25×$1400= 350
Savings=.05×$1400= 70

(7)—Rent=.20×$1600= $320
Food:=.35×$1600= 560
Clothing=.15×$1600= 240
Miscel.=.25×$1600= 400
Savings=.05×$1600= 80

(8)—Rent=.20×$1700= $340
Food=.35×$1700= 595
Clothing=.15×$1700= 255
Miscel.=.25×$1700= 425
Savings=.05×$1700 85

(9)—Rent=.20×$2000= $400
Food=.30×$2000= 600
Clothing=.15×$2000= 300
Miscel.=.25×$2000= 500
Savings=.10×$2000= 200

(10)—Rent=.20×$2200= $440
Food=.30×$2200= 660
Clothing=.15×$2200= 330
Miscel.=.25×$2200= 550
Savings=.10×$2200= 220

(11)—Rent=.20×$2400= $480
Food=.30×$2400= 720
Clothing=.15×$2400= 360
Miscel.=.20×$2400= 480
Savings=.15×$2400= 360

(12)—Rent=.20×$2500= $500
Food=.30×$2500= 750
Clothing=.15×$2500= 375
Miscel.=.20×$2500= 500
Savings=.15×$2500= 375

(13)—Rent=.20×$2700= $540
Food=.30×$2700= 810
Clothing=.15×$2700= 405
Savings=.15×$2700= 405

(14)—Rent=.20×$2800= $560
Food=.30×$2800= 840
Clothing=.15×$2800= 420
Miscel.=.20×$2800= 560
Savings=.15×$2800= 600

(16)—Rent=.20×$3500= $700
Food=.25×$3500= 875
Clothing=.20×$3500= 700
Miscel.=.15×$3500= $525
Savings=.20×$3500= 700

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(1)—Cost of house=$5000
Interest on money invested=4% of $5000 =$200
Carrying expense =110
Total annual expense =$310

(2)—Interest on own money 3½% of $3000 =$105
Interest on mortgage=5% of $2000 =100
Taxes, repairs, etc. =90
Total annual expense =$295

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(3)—Annual rental=12×40		=$480
Interest on $5600 at 5%	=$280	
Cost of maintaining	=$120	
Total annual expense		= 400
Annual saving by buying=$480—$400		=$ 80
(4)—Annual rent of house=12×$40		=$480
Interest on money if in bank=5% of $3000	=$150	
Carrying charges	= 280	
Total annual expense		= 430
Saving by buying=$480—$430		=$ 50
(5)—Annual rental of house=12×$50		=$600
Interest on mortgage=5% of $3500	=$175	
Taxes and water rent	= 104	
Car fare	= 100	
Total expense		= 379
Amt. saved=$600—$379		=$221
(1)—Cost of house rent=12×$20		=$240

(2)—Cost of painting—
4×12 ft.=48 ft. perimeter of room
48×9×1 sq. ft.÷9=48=no. of sq. yds. in walls.
48×.20=$9.60 cost of painting walls.

(3)—Cost of papering—
Perimeter of 1 room=15+12 ft.×2=54 ft.
No. of strips for 1 room=54 ft.÷1½ ft.=36
No. of strips for 4 rooms=4×36 strips=144
144 strips—18=126 strips for walls
Length of 1 strip=9 ft.
Length of 1 single roll=24 ft.
No. of strips from 1 single roll=2½
126÷2½=50+ rolls or 51 single rolls
Cost of papering=51×$0.25=$12.75

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(4)—Area of floors=15×12×1 sq. ft.=180 sq. ft.
No. of sq. yds.=180 sq. ft.÷9 sq. ft.=20 sq. yds.
Area of 4 rooms=4×20 sq. yds.=80 sq. yds.
Area of kitchen=12×12÷9=16 sq. yds.
Total area to be painted (80+16)=96 sq. yds.×.25 per sq .yd.
Cost of kalsomining=96 sq. yds.×.10=$9.60 (=$24.00

(5)—Furnishings—	
gas stove	$18.75
table	2.25
tinware and utensils	21.19
linoleum 9×$1.25	11.25
window shades 3×.69	2.07
Total for furnishing	$55.51

(6)—Dining Room—	
table	$28.00
5 chairs 5×$5.75	28.75
buffet	42.50
serving table	21.00
glassware	9.25
4 tablecloths 4×$4.25	17.00
3 doz. napkins 3×$2.75	8.25
2 shades 2×$.90	1.80
1 rug	18.75
Total cost	$175.30

(7)—Bed rooms—

chiffonier	$ 28.00
bureau	30.00
brass bed	21.00
mattress	13.00
springs	7.00
2 chairs 2×$3.25	6.50
2 shades 2×$.69	1.38
rug	16.75
Total cost	$123.63

Cost two rooms=2×$123.63
=$247.26

(8)—Living room—

center table	$25.00
3 chairs 3×$7.50	22.50
1 chair	11.25
1 couch	22.50
1 rug	21.50
3 pr. curtains 3×$1.75	5.25
3 shades 3×$.90	2.70
Total for living room	$110.70

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(13)—Reading Aug. 1 14500 cu. ft.
Reading July 1 12400 cu. ft.
Gas used during July 2100 cu. ft.÷1000
At $1.10 per thousand 2.1×$1.10=$2.31
(14)—Discount on one thousand=.10
Discount on 2.1M=2.1×.10=.21
(15)—26,800—23,100=3200÷1000×$.80=$2.96
29,400—26,800=2600÷1000× .80= 2.08
31,600—29,400=2200÷1000× .80= 1.76
32,500—31,600= 900÷1000× .80= .72
33,800—32,500=1300÷1000× .80= 1.04

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(1)—In 3 hrs. 1 bulb consuming 25 watts=3×1×25= 75 watts
(2)—In 4 hrs. 2 bulbs consuming 15 watts=4×2×15= 120 watts
(3)—In 6 hrs. 3 bulbs using 25 watts=6×3×25 = 450 watts
(4)—In 5 hrs. 5 bulbs using 45 watts=5×5×45 =1125 watts
(5)—In 4 hrs. 2 bulbs using 60 watts=480 watts
In 4 hrs. 3 bulbs using 25 watts=300 watts
In 4 hrs. 5 bulbs using 10 watts=200 watts
Total =980 watts
(6)—In 3 hrs. 5 bulbs consuming 25 watts will use 375 watts
In 3 hrs. 8 bulbs consuming 15 watts will use 360 watts
In 3 hrs. 12 bulbs consuming 10 watts will use 360 watts
Total for 25 lights =1095 watts
(7)—From problem 3 the lights use 450 watts
In 24 evenings 24×450 watts=10800 watts
There will be 108 thousand watts and at 10 cents a thousand the cost of lighting will be 108×$.10=$1.08
(8)—The 1095 watts in problem 6 used 3 afternoons for 10 weeks will consume 30×1095 watts=32,850 watts.
There will be 32.85 thousand watts used.
The cost will be 32.85×.10 per thousand=$3.29
(9)—Electricity for house. kitchen=3×7×45 watts=135 watts
dining room=1×4×25 watts=100 watts
living room=3×1×60 watts=180 watts
3×2×25 watts=150 watts
1 bedroom=1½×2×15 watts=45
3 bedrooms=3×45 watts =135 watts
Total for 1 day=700 watts
Total for January=31×700 watts=21,700 watts
Or 21.7 thousand@.10 a thousand=$2.17
(Note—If we use only 1 bedroom the total watts=613
31×613 watts÷1000@$.10 a thousand=$1.29 answer in the book.

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(1)—12 qts. milk@12c =$.24
1/4 pt. cream@72c qt. =.09
For 1 day =$.33
For the month 30×.33=$9.90

(2)—In 90 days 3 meals to each day there will be 90×3 meals=270 meals and the family uses a pound of butter to every 8 meals. They will use as many pounds as 270÷8=33 3/4 lbs.

(3)—The family uses 2½ lbs. of potatoes at each of two meals or 2×2½=5 lbs. daily.
From Sept. 1 to June 30—Add the days Sept. 30, Oct. 31, Nov. 30. Dec. 31, Jan. 31, Feb. 28, Mar. 31, April 30, May 31, June 30=303 days.
303×5 lb.=1515 lbs. used from Sept. 1 to June 30.
Considering 60 lbs. to the bushel there would be 1515 lb. ÷60 lbs.=25 1/4 no. of bushels the farmer would have to raise to supply his family.

(4)—The turkey to be roasted 20 minutes for each pound of weight will have to cook 9½×20 min.=190 min.
190 min.=3 hrs. 10 min.
To be ready at 6:30 P. M. it will have to be started 3 hr. 10 min. before 6:30 or 6 hr. 30 min.—3 hr. 10 min.=3:20 P. M.

(5)—Average of 2 lbs. per week for 52 weeks=52×2 lb.=104 lb.
Average cost of 1 lb.=$.45. Total cost=104×.45=$46.80

(6)—Gas stove and heater cost 6×$3.25=$19.50
Coal cost 4×$8=$32.00
Gas stove cheapest.

(7)—If 1 can of fruit uses 1 quart of berries and 1 lb. of sugar,
60 qts. of fruit cost 60×.12½ =$7.50
60 lbs. of sugar=60×.08½ =5.10
Use of gas .004×.90=.036=.04 .04
Cost of cans=.75×5= 3.75
Total $16.39 (book wrong)

(8)—Cost of ice cream for 1 Sunday=1½×.45=.67½
Cost for 1 year=52×.67½=$35.10
If the fruit cost $12.64 and took the place of the ice cream every other Sunday, the total cost would be all the cost of the fruit and one-half the cost of the ice cream or 12.64+(½ of $35.10) or $17.55=$30.19
Saving would be $35.10—$30.19 or $4.91.
Taking the real cost of canning the fruit as $16.39 and adding to $17.55 equals $33.95 with a saving of $1.16.

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(1)—Regular price=12×$.35=$4.20
Reduced price=(12÷4)×$1.10=$3.30
Saving=$4.20—$3.30=$.90

(2)—Regular price of soap=100×.05=$5.00
Reduced price 3.25
Saving $5.00—$3.25 =$1.75

(3)—Regular price of butter=$.45 per lb.
Reduced price = .42 per lb.
Saving on 1 lb.=$.03
Year's supply or 52+3 lbs.=156 lbs.
Saving on year's supply=156×$.03=$4.68.

(4)—Regular price of potatoes=4×.40=$1.60
Reduced price = 1.50
Saving on 1 ton=.10
Saving on 3 tons=3×.30=$.90
(5)—Regular price of 1 yd.=8 1/4c
Reduced price=7½c
Saving on 1 yd.=¾c
Saving on 45 yds.=45×¾c=$.33¾
(6)—Regular price for April =3×6.50=$19.50
Regular price for Sept. =4×$7.00=$28.00
Regular price for Dec. =5×$7.75=$38.75
Total =$86.25
Total number of tons used=12
If bought at April price=$12×$6.50=$78.00
Saving by buying at April price=$86.25—$78.00=$8.25
(7)—If 1/8 barrel flour cost $1.90, 8/8 will cost 8×1.90=$15.20
Reduced price for barrel=$15.00
Saving by buying quantity=$.20

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(8)—$3.15+$2.95+(6×.33=$1.98)=$8.08
100×.05=$5.+(24×.16=$3.84)+(6×.38=$2.28)=$11.12 — $8.08 =$3.04
(1)—.10+.08=.18÷4=.04½
(2)—.06+.06+.20+.10+.18+.08+.12=.80÷4=.20
(3)—1st.=.05+.20+.18+.05+.06+.12+.08=.74
2nd.=.15+.10+.20+.10+.12=.67. Book wrong).
(4)—$1.87+.25+.08+.20+.05+.30+.15 +.20+.35+.70+.50=$4.65÷8=.58⅛.

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(5)—½×.06=.03+(2×.08=.16)+(12/16×.35= .26¼) = 45¼+.50 = .95¼÷12=.08
(6)—.65+.10+.15+.05+.12+.06 + .12+.18+.12+.10+.05=$1.70. (Book wrong).
(7)—$3.79+$1.52+$1.34=$6.65
60×.15=$9.—$6.65=$2.35

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MANUAL TRAINING.

GENERAL RULE: To find the cost of material, multiply the width in inches by the length in inches by the number of pieces, divide by 144 and multiply by the local price per foot for that thickness of lumber. If lumber is more than 1" thick, multiply by thickness also.

(1)—1×9"×15"=135 sq. in. bottom
1×5"×14"= 70 sq. in. partition
2×3"×15"= 90 sq. in. sides
2×3"× 8"= 48 sq. in. ends
343 sq. in.÷144=.238+2.382=2.62 bd. ft.
2.382×.1 (for waste)=.238+2.382=2.62 bd. ft.
2.52×(local price for ½" lumber) 10c=$.252 cost of **lumber**
Figure finish at 1/5 of cost of lumber= .05 finish
25 1 1/4" brads = .01
$.31 total

(2)—4× 2½"×2½"×29"=725 sq. in. legs
1×27 "×50 "=1350 top
2× 5 "×45 "= 450 side rails
2× 5 "×22 "= 220 end rails
2× 2 "×22 "= 88 side rails
2× 8 "×17½"= 280 end panels
1× 4 "×45½"= 182 stretcher
3333 sq. in÷144=23.12 bd.ft+10%=25.43 bd.ft
25.43×local price for material=cost

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(3)—2 pieces 2"×2 "×18 "=144 sq. in. front legs
2 pieces 2"×2 "×30 "=240 sq. in. back legs
6 pieces ¾"×2 "×14 "=121 sq. in. side braces
3 pieces ¾"×2 "×15 "= 67½ sq. in. front braces
2 pieces ¾"×1½"×15 "= 16⅞ sq. in. rear braces
1 piece ¾"×2½"×15 "= 28⅛ sq. in. rear braces
6 pieces ¾"×4 "×16½"= 99 sq. in. arms
716½ sq. in÷144=5 bd. ft.+10%
(=5.5 bd. ft.
5.5×9c=50c cost of lumber.
(4)—1 piece 1"×20 "×36"=720 sq. in. top
4 pieces 2"× 2 "×30"= 480 sq. in legs
2 pieces ¾"× 4 "×17"= 136 sq. in top side rails
2 pieces ¾"× 1½"×17"= 51 sq. in. lower side rails
1 piece ¾"× 4 "×32"= 128 sq. in. upper back rail
1 piece ¾"× 1½"×32"= 48 sq. in. lower back rail
1 piece ¾"×18 "×30"= 540 sq. in. shelf
1 piece ½"× 3 "×34"= 102 sq. in. back rail around top
2 pieces ½"× 3 "×10"= 60 sq. in. side rail around top
2265 sq. in.÷144=15.7 bd. ft.
15.7+10%=17.3 bd. ft. total for telephone stand.

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(8)—2 pieces ½"×11"×12"=264 sq. in. sides
2 pieces ½"×10"×12"=240 sq. in. sides
1 piece ½"× 7"× 7"= 49 sq. in. bottom
553 sq. in. +10%=608.3 sq. in.
608.3÷144=4.22 bd. ft.×7.5c=32c=cost of lumber.
(9)—1 piece 1"×12"×12"=144 sq. in. top
3 pieces 1"× 6"×15"=720 sq. in. legs
3 pieces 1"× 2"× 5"= 30 sq. in. braces
444 sq. in.+10%=488.8 sq. in.=4.1 bd. ft.

REVIEW:

Figure 1.
Area=1½×area of a circle of 10" diameter+area of an equilateral triangle 10" on one side.

Figure 2.
Area=area of a square 10" on the side+2×the area of a 10" circle.

Figure 3.
Area=2×area of a 10" circle+area of a rectangle 10"×20".

Figure 4.
Area=area of a square 20" on the side—area of a 20" circle.

Figure 5.
Area=area of a circle with a diameter=the diagonal of a square 15″ on the side—the area of a square 15″ on the side.

Figure 6.
Area=area of a square 20″ on the side—the area of a 20″ circle.

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(1)—5×7×1 sq. in.=35 sq. in.
(2)—10×12×1 sq. in.=120 sq. in.
(3)—12×15×1 sq. in.=180 sq. in.
(4)—16×20×1 sq. in.=320 sq. in.
(5)—18×21×1 sq. in.=378 sq. in.
(6)—11/4×3×1 sq. ft.= 8 1/4 sq. ft.
(7)—7/1×4×1 sq. ft.=14 sq. ft.
(8)—11/3×5×1 sq. ft.=18 1/3 sq. ft.
(9)—31/6×7×1 sq. ft.=36 1/6 sq. ft.
(10)—101/12×9×1 sq. ft.=75 3/4 sq. ft.
(11)—25/2×6×1 sq. ft.=75 sq. ft.
(12)—46/3×2×1 sq. ft.=92 sq. ft.
(13)—26/3×9/2×1 sq. ft.=39 sq. ft.
(14)—113/6×17/3×1 sq. ft.=106 13/18 sq. ft.
(15)—263/12×37/4×1 sq. ft.=202 35/48 sq. ft.
(16)—4×7×10×1 sq. in.=280 sq in.
(17)—4×9×15×1 sq. in.=540 sq. in.
(18)—4×12×18×1 sq. in.=864 sq. in.
(19)—4×15×20×1 sq. in.=1200 sq. in.
(20)—4×21×20×1 sq. in.=1680 sq. in.
(21)—4×2×29/12×1 sq. ft.=19 1/3 sq. ft.
(22)—4×3×9/2×1 sq. ft.=54 sq. ft.
(24)—4×4×31/2×1 sq. ft.=248 sq. ft.
(25)—4×6×113/6×1 sq. ft=452 sq. ft.
(26)—4×15/2×21×1 sq. ft.=630 sq. ft.
(27)—4×25/3×35×1 sq. ft.=1166 2/3 sq. ft.
(28)—2(9+10)×36+2×9×10×1 sq. in.=1548 sq. in.
(29)—2(10+12)×48+2×10×12×1 sq. in.=2352 sq. in.
(30)—2(1+1 1/4)×3+5/4×2×1 sq. ft.=16 sq. ft.
(31)—2(3+2 1/3)×4+2×3×7/3×1 sq, ft.=56 2/3 sq. ft.
(32)—2(4½+2)×7+2×9/2×2×1 sq. ft=109 sq. ft.
(33)—2(4 5/6+2/3)×6+2×2/3×29/6×1 sq. ft.=72 4/9 sq. ft.
(34)—2(5+3 1/6)×4+2×5×19/6×1 sq. ft.=97 sq. ft.
(35)—2(2 1/4+3 1/12)×4½+2×9/4×37/12×1 sq. ft.=61 7/8 sq. ft.
(36)—2 (3 2/3+2 7/12)×5 3/4+2×11/3×31/12×1 sq. ft.=90
(59/72 sq. ft.
(37)—2(4 7/12+3 1/12)×13/3+2×55/12×37/12×1 sq. ft.=94 51/72
(sq. ft.
(38)—2(6½+4 1/3)×19/2+2×13/2×13/3×1 sq. ft.=262 1/6 sq. ft.
(39)—2(6 3/4+5 1/12)×31/3+2×27/4×61/12×1 sq. ft.=313 13/72
(sq. ft.
(40)—2(8 1/4+4 2/3)×47/4+2×33/4×14/3×1 sq. ft.=380 13/24
(sq. ft.
(41)—2(9 2/3+3 11/12)×41/4+2×29/3×47/12×1 sq. ft.= 354
(13/72 sq. ft.

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(1)—10×5×1 cu. in.=50 cu. in.
(2)—15x7×1 cu. in.=105 cu. in.
(3)—16×9×1 cu. in.=144 cu. in.

(4)—20x12x1 cu. in.=240 cu. in.
(5)—18×25×1 cu. in.=450 cu. in.
(6)—24×48×1 cu. in.=1152 cu. in.
(7)—27×72×1 cu. in.=1944 cu. in.
(8)—(3×144)×21×1 cu. in=9072 cu. in.
(9)—10×16×1 cu. ft.=160 cu. ft.
(10)—12×18×1 cu. ft.=216 cu. ft.
(11)—15×20×1 cu. ft.=300 cu. ft.
(12)—18×24×1 cu. ft.=432 cu. ft.
(13)—(10×10)×12×1 cu. in=1200 cu. in.
(14)—(15×15)×18×1 cu. in=4050 cu. in.
(15)—(16×16)×24×1 cu. in.=6144 cu. in.
(16)—(18×18)×25×1 cu. in.=8100 cu. in.
(17)—(2×2)×5×1 cu. ft.=20 cu. ft.
(18)—(3×3)×3½×1 cu. ft.=31½ cu. ft.
(19)—(3×3)×3¾×1 cu. ft.=33¾ cu. ft.
(20)—(4×4)×6×1 cu. ft.=96 cu. ft.
(21)—(3½×3½)×7×1 cu. ft.=85¾ cu. ft.
(22)—(5⅔×5⅔)×12×1 cu. ft.=385⅓ cu. ft.
(23)—(6⅓×6⅓)×15×1 cu. ft.=601⅔ cu. ft.
(24)—(8⅚×8⅚)×20×1 cu. ft.=1560 5/9 cu. ft.
(25)—24 sq. in.×15=360 cu. in.
(26)—30 sq. in.×18=540 cu. in.
(27)—40 sq. in.×20=800 cu. in.
(28)—42 sq. in×35=1470 cu. in.
(29)—10 sq. ft.×12=120 cu. ft.
(30)—10 sq. ft.×15=150 cu. ft.
(31)—12 sq. ft.×12=144 cu. ft.
(32)—15 sq. ft.×10=150 cu. ft.
(33)—6 sq. ft.×3½=21 cu. ft.
(34)—8 sq. ft.×2¾=22 cu. ft.
(35)—8 sq. ft.×3⅔=29⅓ cu. ft.
(36)—9 sq. ft.×5¼=47¼ cu. ft.

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(1)—15×10×1 sq. in=150 sq. in.
(2)—18×24×1 sq. in.=432 sq. in.
(3)—20×30×1 sq. in.=600 sq. in.
(4)—24×35×1 sq. in.=840 sq. in.
(5)—27×10×1 sq. in=270 sq. in.
(6)—45×12×1 sq. in.=540 sq. in.
(7)—54×18×1 sq. in.=972 sq. in.
(8)—5⅔×2×1 sq. ft.=11⅓ sq. ft.
(9)—3.1416×4×1 sq. ft.=12.5664 sq. ft.
(10)—6.2832×6×1 sq. ft.=37.6992 sq. ft.
(11)—5.1112×5×1 sq. ft.=25.556 sq. ft.
(12)—9.4248×6×1 sq. ft.=56.5488 sq. ft.
(13)—Surface — lateral = 6×2×3.1416×15=565.488 sq. in.
Surface—bases=2 (12×3.1416×6/2)=226.1952 sq. in.
Total= 791.6832 sq. in

(14)—8 × 2 × 3.1416 =904.7808 sq. n.
2 (16×3.1416×8/2)=402.1248 sq. in.
Total= 1306.9056 sq. in.

(15)—10 × 2 × 3.1416×25=1570.80 sq. in.
2 (20×3.1416×8/2)= 628.32 sq. in.
Total 2199.12 sq. in.

(16)—12 × 2 × 3.1416×30=2261.952 sq. in.
2 (24×3.1416×12/2=904.7808 sq. in.
Total= 3166.7328 sq. in.
(17)—1¼ × 2 × 3.1416 × 5 = 39.27 sq. ft.
2 (2½×3.1416×1¼/2= 9.8175 sq. ft.
Total= 49.0875 sq. ft.
(18)—2½ × 2 × 3.1416×6=94.248 sq. ft.
2 (5×3.1416×2½/2=39.27 sq. ft.
Total= 133.518 sq. ft.
(1)—10 sq. in.×15=150 cu. in.
(2)—12 sq. in.×18=216 cu. in.
(3)—15 sq. in.×20=300 cu. in.
(4)—16 sq. in.×20=320 cu. in.
(5)—18 sq. in×24=432 cu. in.
(6)—2 sq. ft.×3=6 cu. ft.
(7)—2 sq. ft.×5=10 cu. ft.
(8)—3 sq. ft.×4=12 cu. ft.
(9)—4 sq. ft.×5=20 cu. ft.
(10)—5 sq. ft.×6=30 cu. ft.
(11)—1.5 sq. ft.×3½=5.25 cu. ft.
(12)—2.4 sq. ft.×4¼=10.2 cu. ft.
(13)—3.1 sq. ft.×5⅔=17.56666 cu. ft.
(14)—4.5 sq. ft.×4.5=20.25 cu. ft.
(15)—5.6 sq. ft.×8⅚=49.4666 cu. ft.

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(16)—4×2×3.1416×2×10=502.656 cu. in .
(17)—3×2×3.1416×16×15=424.116 cu. in.
(18)—5×2×3.1416×2½×12=942.48 cu. in.
(19)—6×2×3.1416×3×15=1696.464 cu. in.
(20)—9×2×3.1416×4½×18=4580.4528 cu. in.
(21)—2×2×3.1416×1×3½=43.9824 cu. ft.
(22)—1×2×3.1416×½×3⅔=11.5192 cu. ft.
(23)—2×2×3.1416×1×4¼=53.4072 cu. ft.
(24)—1¼×2×3.1416×⅝×2=9.8175 cu. ft.
(25)—1½×2×3.1416×¾×5=35.343 cu. ft.
(26)—1¼×2×3.1416×⅝×3½=17.1804625 cu. ft.
(27)—1½×2×3.1416×¾×3⅔=25.9182 cu. ft.
(28)—1¾×2×3.1416×⅞×4½=43.295175 cu. ft.
(29)—2⅔×2×3.1416×1⅓×5⅙=115.4243 cu. ft.
(30)—3½×2×3.1416×1¾×6⅚=262.9781 cu. ft.

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(1)—½ (15×10×1 sq. in.)=75 sq. in.
(2)—½ (16×12×1 sq. in.)=96 sq. in.
(3)—½ (18×15×1 sq. in.)=135 sq. in.
(4)—½ (20×17×1 sq. in.)=170 sq. in.
(5)—½ (24×18×1 sq. in.)=216 sq. in.
(6)—½ (2× 1/3×1 sq. in.)=1 1/3 sq. ft.
(7)—½ (3×2×1 sq. ft.)=3 sq. ft.
(8)—½ (4×2½×1 sq. ft.)=5 sq. ft.
(9)—½ (2½×5×1 sq. ft.)=6¼ sq. ft.
(10)—½ (3×6×1 sq. ft.)=9 sq. ft.
(11)—½ (2½×3½×1 sq. ft.)=4⅜ sq. ft.
(12)—½ (3⅔×1⅓×1 sq. ft.)=2 4/9 sq. ft.
(13)—½ (4⅓×2⅚×1 sq. ft.)=6 5/36 sq. ft.
(14)—½ (4½×5⅔×1 sq. ft.)=12.75 sq. ft.
(15)—½ (5¼×6⅔×1 sq. ft.)=17.5 sq. ft.

(16)—½ (4×8×15×1 sq. in.)=240 sq. in.
(17)—½ (4×9×16×1 sq. in.)=288 sq. in.
(18)—½ (4×9×20×1 sq. in.)=360 sq. in.
(19)—½ (4×10×24×1 sq. in.)=480 sq. in.
(20)—½ (4×12×36×1 sq. in.)=864 sq. in
(21)—½ (4×2×5×1 sq. ft.)=20 sq. ft.

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(22)—½ (4×2×2¼×1 sq. ft.)=9 sq. ft .
(23)—½ (4×1 1/12×2×1 sq. ft.)=4⅓ sq. ft.
(24)—½ (4×1⅙×5×1 sq. ft.) 11⅔ sq. ft.
(25)—½ (4×1½×4×1 sq. ft.)=12 sq. ft.
(26)—½ (4×1½×2¼×1 sq. ft.)=6¾ sq. ft.
(27)—½ (4×1⅔×2¾×1 sq. ft.)=9⅙ sq. ft.
(28)—½ (4×2½×3⅔×1 sq. ft.)=18⅓ sq. ft.
(29)—½ (4×3 7/12×4 11/12×1 sq. ft.)=35.23 sq. ft.
(30)—½ (4×4 5/12×5¼×1 sq. ft.)=46⅜ sq. ft.

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(1)—½ (8×6×1 sq .in.)=24 sq. in.
(2)—½ (8×7×1 sq. in.)=28 sq. in.
(3)—½ (9×5×1 sq. in)=22½ sq. in.
(4)—½ (9×6×1 sq. in.)=27 sq. in.
(5)—½ (10×8×1 sq. in)=40 sq .in.
(6)—½ (24×10×1 sq. in.)=120 sq. in.
(7)—½ (24×14×1 sq. in.)=168 sq. in.
(8)—½ (24×19×1 sq. in.) 228 sq. in.
(9)—½ (18×24×1 sq. in.)=216 sq. in.
(10)—½ (19×36×1 sq. in.) 342 sq. in.
(11)—½ (2⅓×2½×1 sq. ft.)=2 11/12 sq. ft.
(12)—½ (2¾×3⅓×1 sq. ft.)=4 7/12 sq. ft.
(13)—½ (3½×4⅔×1 sq. ft.) 8⅙ sq. ft.
(14)—½ (3 11/12×3 5/12×1 sq. ft.)=6.69 sq. ft.
(15)—½ (4⅝×5 11/12×1 sq. ft.)=14.29 sq. ft.
(16)—½ (2×1×3.1416×6)=18.8496 sp. in.
(17)—½ (2×2×3.1416×6)=37.6992 sq. in.
(18)—½ (2×2×3.1416×9)=56.5488 sq. in.
(19)—½ (2×3×3.1416×15)=141.372 sq. in.
(20)—½ (2×3×3.1416×19) 179.0712 sq. in.
(21)—½ (2×12×3.1416×21)=791.6832 sq. in.
(22)—½ (2×12×3.1416×25)=942.48 sq. in.
(23)—½ (2×11×3.1416×36)=1244.0736 sq. in.
(24)—½ (2×15×3.1416×24) 1130.976 sq. in.
(25)—½ (2×18×3.1416×60)=3392.928 sq. in.
(26)—½ (2×14×3.1416×25)= 099.56 sq. in.
(27)—½ (2×19×3.1416×40)=2387.618 sq. in.
(28)—½ (2×25×3.1416×54)= 4241.16 sq. in.
(29)—½ (2×41×3.1416×65)= 8372.364 sq. in.
(30)—½ (2×42×3.1416×80) 10555.776 sq. in.

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(1)—⅓ (6×6×15)=180 cu. in.
(2)—⅓ (9×9×20)=540 cu. in.
(3)—⅓ (9×9×28)=756 cu. in.
(4)—⅓ (1×1×2)=⅔ cu. ft.
(5)—⅓ (2×2×8)=10⅔ cu. ft.
(6)—⅓× (2½×2½×9)=18.75 cu. ft.
(7)—⅓ (1¼×1¼×6)=3.125 cu. ft.

(8)—⅓ (1½×1½×9¼)=6.9375 cu. ft. (Book wrong).
(9)—⅓ (1 5/6×1 5/6×14½=16.245 cu. ft. (Book wrong).
(10)—⅓ (12×3.1416×3×15)=565.488 cu. in.
(11)—⅓ (16×3.1416×4×20)=1340.416 cu. in.
(12)—⅓ (18×3.1416×4½×30)=2544.696 cu. in.
(13)—⅓ (2×3.1416×½×2½)=2.618 cu. ft.
(14)—⅓ (3×3.1416×¾×3¼)=7.65765 cu. ft.
(15)—⅓ (2¼×3.1416×9/16×4)=5.30145 cu. ft.
(16)—⅓ (1¼×3.1416×5/16×4½)=1.8478+ cu. ft.
(17)—⅓ (1½×3.1416×⅜×5⅔)=3.337+ cu. ft.
(18)—⅓ (1⅓×3.1416×⅓×5¾)=2.6761 cu. ft.
(19)—⅓ (1⅙×3.1416×7/24×5½)=1.959+ cu. ft.
(20)—⅓ (2¼×3.1416×9/16×6 1/12)=8.062+ cu. ft.
(21)—⅓ (2 1/3×3.1416×7/12×4½)=6.4141+ cu. ft.

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(1)—$(2\times2)^2\times3.1416=50.2656$ sq. in.
(2)—$(3\times2)^2\times3.1416=113.0976$ sq. in. (Book wrong).
(3)—$(4\times2)^2\times3.1416=1.3962$ sq. ft.
(4)—$(5\times2)^2\times3.1416=2.1816$ sq. ft.
(5)—$(6\times2)^2\times3.1416=3.1416$ sq. ft.
(6)—$(8+2)^2\times3.1416=5.585$ sq. ft.
(7)—$(1\times2)^2\times3.1416=12.566$ sq. ft.
(8)—$(1.1\times2)^2\times3.1416=15.2053$ sq. ft.
(9)—$(1.5\times2)^2\times3.1416=28.2744$ sq. ft.
(10)—$(1.6\times2)^2\times3.1416=32.1699$ sq. ft.
(11)—$(1.8\times2)^2\times3.1416=40.7151$ sq. ft.
(12)—$(1.25\times2)^2\times3.1416=19.635$ sq. ft.
(13)—10×10×3.1416=2.1816 sq. ft.
(14)—14×14×3.1415=4.970+ sq. ft.
(15)—15×15×3.1416=4.9087 sq. ft.
(16)—18×18×3.1416=7.0686 sq. ft.
(17)—20×20×3.1416=8.7266 sq. ft.
(18)—23×23×3.1416=11.541 sq. ft.
(19)—1⅙×1⅙×3.1416=4.276 sq. ft.
(20)—1¼×1¼×3,1416=4.9087 sq. ft.
(21)—1⅓×1⅓×3.1416=5.585 sq. ft.
(22)—1 7/12×1 7/12×3.1416=7.8758 sq. ft.
(23)—1¾×1¾×3.1416=9.6211 sq. ft .
(24)—1⅚×1⅚×3.1416=10.5592 sq. ft.
(25)—½ (24×24×3.1416)=904.7808 sq. ft.
(26)—8000×8000×3.1416=201,062,400 sq. mi.
8000×11=88000×88000×3.1416=24,328,550,400 sq. mi. (Book wrong).

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(1)—4/3 (1×1×1×3.1416)=4.1888 cu. in.
(2)—4/3 (2×2×2×3.1416)=33.5104 cu. in.
(3)—4/3 (3×3×3×3.1416)=113.0976 cu. in.
(4)—4/3 (4×4×4×3.1416)=268.0832 cu. in.
(5)—4/3 (5×5×5×3.1416)=523.6 cu. in.
(6)—4/3 (1×1×1×3.1416)=4.1888 cu. ft.
(7)—4/3 (1.2×1.2×1.2×3.1416)=7.2382 cu. ft.
(8)—4/3 (1.5×1.5×1.5×3.1416)=14.1372 cu. ft.
(9)—4/3 (1.8×1.8×1.8×3.1416)=24.429 cu. ft.
(10)—4/3 (1.25×1.25×1.25×3.1416)=8.18125 cu. ft.
(11)—4/3 (5/2×5/2×5/2×3.1416)=65.45 cu. in.
(12)—4/3 (8/2×8/2×8/2×3.1416)=268.0832 cu. in.

(13)—4/3 (9/2×9/2×9/2×3.1416)=381.7044 cu. in.
(14)—4/3 (11/2×11/2×11/2×3.1416)=696.9116 cu. in.
(15)—4/3 (13/2×13/2×13/2×3.1416)=1150.3492 cu. in.
(16)—4/3 (⅝×⅝×⅝×3.1416)=1.022 cu. ft.
(17)—4/3 (⅔×⅔×⅔×3.1416)=1.2411 cu. ft.
(18)—4/3 (5/6×5/6×5/6×3.1416)=2.424 cu. ft.
(19)—4/3 (9/8×9/8×9/8×3.1415)=5.963 cu. ft.
(20)—4/3 (5/4×5/4×5/4×3.1416)=8.18125 cu. ft.

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1. **1916-9- 1** $500
1916-3-15 .06
1916-1- 1 2 mo.=1/6 : 30.00=int. for 1 yr.
2-14=$200 10 da.=1/6 : 5.00=int. for 2 mo.
4 da.=2/3 : .83=int. for 10 days.
: .33=int. for 4 days.
6.166=int. for 2 mo. 14 days.
500. =p.
506.166=amt.
200. =1st paym't.
$306.166=2nd principal.
.06
:$18.36996=int. for 1 yr.
4 mo.=1/3 : 6.123 =int. for 4 mo.
1 mo.=1/4 : 1.53 =int. for 1 mo.
15 da.=1/2 : .765 =int. for 15 days.
1 da.=1/15: .051 =int. for 1 day.
$8.469 =int. for 5 mo. 16 days.
306.166 =p.
$314.635 =amt.

2. 1918-4-15 $250.60 =p.
1918-3-13 .07
1918-1- 1 2 mo.=1/6 : 17.542=int. for 1 yr.
1917-9-20 10 da.=1/6 : 2.923 =int. for 2 mo.
1917-7- 7 3 da.=3/10: .487=int. for 10 days.
2-13—$80 : .146=int. for 3 days.
3-11— 50 $3.556=int for 2 mo. 13 days.
2-12— 50 250.60 =p.
1- 2 254.156=amt.
80. =1st payment.
$174.156=2nd p.
.07
:$12.19092=int. for 1 yr.
3 mo.=1/4 : 3.048 =int. for 3 mo.
10 da.=1/9 : .338 =int. for 10 days.
1 da.=1/10: .033 =int. for 1 day.
$3.419 =int. for 3 mo. 11 days.
174.156 =p.
$177.575 =2nd amt.
50. =2nd payment.
$127.575 =3rd p.
.07
2 mo.=1/6 :$8.93025 =int. for 1 yr.
12 da.=1/5 : 1.488 =int. for 2 mo.
: .297 = int. for 12 days.
1.785 = int. for 2 mo. 12 days.
127.575 =p.
$129.360 =4th amt.
50. = 3rd payment.
$79.36 = 4th p.
.07
1 mo.=1/12:$5.5552 =int. for 1 yr.
1 da.=1/30: .463 =int. for 1 mo.
: .015 =int. for 1 da.
.478 =int. for 1 mo. 1 da.
79.838
79.84 =amt. due at maturity.

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3. 1920- 1- 1
1919- 2- 4
1919- 1- 1
1918-10- 1
1918- 5- 1
1917- 6- 4
10-27
5
3
1- 3
10-27

$800=p.
.06
6 mo.=1/2 : 48.00=int. for 1 yr.
4 mo.=1/3 : 24.00=int. for 6 mo.
20 da.=1/6 : 16. =int. for 4 mo.
7 da.=7/20: 2.66=int. for 20 days.
: .93=int. for 7 days.
43.59=int. for 10 mo. 27 days.
$800. =p.
$843.59=amt.
144.00=1st payment
$699.59=2nd p.
.06
:$ 41.9754=int. for 1 yr.
17.49 =int. for 5 mo.
699.59 =2nd p.
717.08 =amt.
90. =2nd payment.
627.08 =3rd p.
.06
3 mo.=1/4 :$ 37.6248 =int. for 1 yr.
9.406 =int. for 3 mo.
627.09 =p.
636.496 =payment
400. =amt.
236.496 =p.
.06
1 mo.=1/12: 14.18976 =int. for 1 yr.
3 da.=1/10: 1.182 =int. for 1 mo.
: .118 =int. for 3 days.
1.300 =int. for 1 mo. 3 days.
$236.496 =p.
237.796 =amt.
100. =payment.
137.80 =p.
.06
6 mo.=1/2 : 8.2248 =int. for 1 yr.
4 mo.=1/3 : 4.1124 =int. for 6 mo.
27 da.=3/40: 2.408 =int. for 4 mo.
: .61 =int. for 27 days.
7.1304 =int. 10 mo. 27 da.
137.80 =p.
$144.93 =amt. due.

4. 1919- 5--1
1919- 1-1 .015=int. on $1 for 3 mo.
1918-11-1 6255×.015=$93.825=int.
1918- 1-1
1917-10-1 6255. =p.
3-0=$2000 6348.825=amt.
10-0= 200 2000.
2-0= 3000 4348.825=2nd p.
4-0 .06
260.92950=int.
4348.825 =p.
4609.75 =amt.
3200. =2nd & 3rd payments.
1409.75 =3rd p.
.02
28.1950 =int.
$1409.75
$1437.94 =amt. due at maturity.

5. 1920-8-14
1920-1- 1
1919-8- 3
1919-2-19
1918-3-13
1917-1-17
1916-4- 7
9-10-.046 2/3 int. on $1 =$200 payment.
1-26=.009 1/3=$25
11- 6=.056 $750. =p.
5-14=.027 1/3 .046 2/3
4-28=.024 2/3 4500.
7-13=.037 1/6 3000
500
$35.000 =int.
$750. =p.
785. =amt.
200. =payment
585. =2nd p.
.009 1/3 =int. on $1 1 mo. 26 da.
5.265
.195
5.460 =int. on $585.
585. =p.
590.46
25.00 =payment.
565.46
.056 =int. on $1 11 mo. 6 da.
339276
282730
Int. exceeds payment 31.665 =int. on $565.46.
$565.46×.027 1/3=$15.45+31.66=$47.118.

$565.46 =p.
47.118 =int.
612.578 =amt.
230. =payments.
382.578 =p.
.024 2/3=int. on $1 for given time
9.436 =int. on $382.578 for
382.578 =p. (given time.
$392.014 =amt.
150. =payment.
242.014 =p.
037 1/6=int. on $1.
1694098
726042
40335
$8.994853
242.01
$251.00 =amt. due at maturity.

6. 1918- 1-1
1914- 1-1
1913-10-1
1913- 7-1
1913- 4-1
1913- 1-1 Paymts.
3-0 $100
3-0 200
3-0 300
3-0 400

.015 =int. on $1 for 3 mo.
1000
$15.000=int. on $1000 for 3 mo.
1000. =p.
$1015. =amt.
100. =1st payment.
915. =2nd p.
.015 =int. on $1. for 3 mo.
$13.72 =int. on $915 for 3 mo.
915 =p.
928 72 =amt.
200
728.72 =3rd p.
.015
10.93 =int. on $1 for 3 mo.
728.72 =p.
739.65 =amt.
300. =payment.
439.65 =p.
.015 =int. on $1 for 3 mo.
6.59 =int. on $439.65.
439.65 =p.
446.24 =amt.
400. =payment.
46.24 =new p.
.24 =int. on $1 for 4 yrs.
18496
9248
11.0976 =int. on $46.24 for 4 yrs.
46.24
$57.34 =amt. at maturity.

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(1)—From Feb. 4, 1916, to Nov. 28, 1918=2 yr. 9 mo. 24 da.
From Dec. 18, 1916, to Nov. 28, 1918=1 yr. 11 mo. 10 da.
From June 24, 1917, to Nov. 28, 1918=1 yr. 5 mo. 4 da.
From Sept. 11, 1917, to Nov. 28, 1918=1 yr. 2 mo. 17 da.
From July 5, 1918, to Nov. 28, 1918=0 yr. 7 mo. 5 da.

Interest on $700 at 6% for 1 yr.=$42.
Interest on $700 at 6% for 2 yr.= 2×$42. =$84.00
Interest on $700 at 6% for 6 m.= 1/2 of $42 = 21.00
Interest on $700 at 6% for 3 m.= 1/2 of 21. = 10.50
Interest on $700 at 6% for 15 da.= 1/6 of $10.50 = 1.75
Interest on $700 at 6% for 5 da.= 1/3 of $ 1.75 = .582
Interest on $700 at 6% for 4 da.= 4/5 of $ .582 = .464
$700+$118.296=$818.30 amt. for 2 yr. 9 mo. 24 da.

Interest on $164 at 6% for 1 yr.=$ 9.84 $ 9.84
Interest on $164 at 6% for 6 m.= 1/2 of $9.84 = 4.92
Interest on $164 at 6% for 4 m.= 1/3 of $9.84 = 3.28
Interest on $164 at 6% for 1 m.= 1/4 of $3.28 = .82
Interest on $164 at 6% for 10 da.= 1/3 of $ .82 = .27
Interest on $200 at 6% for 1 yr. 5 m. 4 da. =$19.13
$164+$19.13=$183.13 amt. of $164 for 1 yr. 11 m. 10 da.

Interest on $200 at 6% for 1 yr.=$12. $12.00
Interest on $200 at 6% for 4 m.= 1/3 of $12.00 = 4.00
Interest on $200 at 6% for 1 m.= 1/4 of $ 4.00 = 1.00
Interest on $200 at 6% for 3 da.= 1/10 of $ 1.00 = .10
Interest on $200 at 6% for 1 da.= 1/3 of $ 0.10 = .03
Interest on $200 at 6% for 1 yr. 5 m. 4 da. =$17.13
$200+$17.13=$217.13 amt. of $200 for 1 yr 5 m. 4 da.

Interest on $120 at 6% for 1 yr.=$7.20 $ 7.20
Interest on $120 at 6% for 2 m.= 1/6 of $7.20 = 1.20
Interest on $120 at 6% for 10 da.= 1/6 of $1.20 = .20
Interest on $120 at 6% for 6 da.= 1/10 of $1.20 = .12
Interest on $120 at 6% for 1 da.= 1/6 of $ .12 = .02
Interest on $120 at 6% for 1 yr. 2 m. 17 da. =$8.74
$120+$8.74=$128.74 amt. for 1 yr. 2 m. 17 da.

Interest on $ 60 at 6% for 1 yr.=$3.60
Interest on $ 60 at 6% for 4 m.= 1/3 of $3.60 =$1.20
Interest on $ 60 at 6% for 15 da.= 1/8 of $1.20 = .15
Interest on $ 60 at 6% for 5 da.= 1/3 of $ .15 = .05
Interest on $ 60 at 6% for 3 da.= 1/5 of $ .15 = .03
Interest on $ 60 at 6% for 4 m. and 23 da. =$1.43
$60+$1.43=$61.43 amt. for 4 m. 23 da.

$183.13	
$217.13	
$128.74	$818.30
$ 61.43	$590.43
$590.43	$227.87 amt. due at maturity.

(2)—From Jan. 1, 1918, to Dec. 16, 1918=11 m. 15 da.
From Mar. 1, 1918, to Dec. 16, 1918= 9 m. 15 da.
From May 16, 1918, to Dec. 16, 1918= 7 m. 00 da.
From Sept. 1, 1918, to Dec. 16, 1918= 3 m. 15 da.
From Dec. 11, 1918, to Dec. 16, 1918= 0 m. 5 da.

Interest on $172.80 at 6% for 1 yr.=$7.368
Interest on $172.80 at 6% for 6 m.= ½ of $7.368 =$3.684
Interest on $172.80 at 6% for 4 m.= ⅓ of $7.368 =$2.456
Interest on $172.80 at 6% for 1 m.= ¼ of $2.456 =$ .614
Interest on $172.80 at 6% for 15 da.= ½ of $ .614 =$ .307
Interest on $172.80 at 6% for 11 m. and 15 da. =$7.061
$172.80+$7.06=$179.86 amount of prin. for 11 m. 15 da.

Interest on $30 at 6% for 1 yr.=$1.80
Interest on $30 at 6% for 6 m.= 1/2 of $1.80 =$ .90
Interest on $30 at 6% for 3 m.= 1/2 of $ .90 =$ .45
Interest on $30 at 6% for 15 da.= 1/6 of $ .45 =$ .075
Interest on $30 at 6% for 9 m. and 15 da. =$1.425
$30+$1.425=$31.425 amt. of $30 for 9 m. 15 da.

Interest on $15 at 6% for 1 yr.=$.90
Interest on $15 at 6% for 6 m.= 1/2 of $.90 =$.45
Interest on $15 at 6% for 1 m.= 1/6 of $.45 =$.075
Interest on $15 at 6% for 7 m. =$.525
$15+$.525=$15.525 amount of $15 for 7 m.

Interest on $27 at 6% for 1 yr.=$1.62
Interest on $27 at 6% for 3 m.= 1/4 of $1.62 =$.405
Interest on $27 at 6% for 15 da.= 1/6 of $.405 =$.067
Interest on $27 at 6% for 3 m. and 15 da. =$.47
$27+$.47=$27.47 amt. of $27 for 3 m. 15 da.

Interest on $13.50 at 6% for 1 yr.=$.81
Interest on $13.50 at 6% for 1 m.=$.063
Interest on $13.50 at 6% for 5 da.= 1/6 of $.063 =$.01
$13.50+$.01=$13.51 amount of $13.50 for 5 da.

$31.425 $179.86 amt. of prin.
$15.525 $ 87.93 amt. of payments.
$27.470 $ 91.93 balance due at maturity.
$13.510
$87.93

(3)—From July 8, 1917, to May 11, 1918=10 m. 3 da.
From Sept. 23, 1918, to May 11, 1918= 7 m. 18 da.
From Nov. 20, 1917, to May 11, 1918= 5 m. 21 da.
From Jan. 17, 1918, to May 11, 1918= 3 m. 24 da.
From Feb. 8, 1918, to May 11, 1918= 3 m. 3 da.

Interest on $500 at 6% for 1 yr.=$30.
Interest on $500 at 6% for 6 m.= 1/2 of $30 =$15.00
Interest on $500 at 6% for 4 m.= 1/3 of $30 =$10.00
Interest on $500 at 6% for 3 da.= 1/40 of $10 =$ .25
Interest on $500 at 6% for 10 m. and 3 da =$25.25
$500+$25.25=$525.25 amt. for 10 m. 3 da.

Interest on $60 at 6% for 1 yr.=$3.60
Interest on $60 at 6% for 6 m.= 1/2 of $3.60 =$1.80
Interest on $60 at 6% for 1 m.= 1/6 of $1.80 =$ .30
Interest on $60 at 6% for 15 da.= 1/2 of $ .30 =$ .15
Interest on $60 at 6% for 3 da.= 1/5 of $ .15 =$ .03
Interest on $60 at 6% for 7 m. 18da. =$2.28
$60+$2.28=$62.28 amt. for 7 m. 18 da.

Interest on $100 at 6% for 1 yr.=$6
Interest on $100 at 6% for 4 m.= 1/3 of $6.00 =$2.00
Interest on $100 at 6% for 1 m.= 1/4 of $2.00 =$ .50
Interest on $100 at 6% for 15 da.= 1/2 of $ .50 =$ .25
Interest on $100 at 6% for 6 da.= 1/5 of $ .50 =$ .10
Interest on $100 at 6% for 5m. and 21 da =$2.85
$100+$2.85=$102.85 amt. of $100 for 5 m. 21 da.

Interest on $200 at 6% for 1 yr.=$12
Interest on $200 at 6% for 3 m.= 1/4 of $12.00 =$3.00
Interest on $200 at 6% for 15 da.= 1/6 of $ 3.00 =$ .50
Interest on $200 at 6% for 6 da.= 2/5 of $ .50 =$ .20
Interest on $200 at 6% for 3 da.= 1/2 of $ .20 =$ .10
Interest on $200 at 6% for 3 m. 24 da. =$3.80
$200+$3.80=$203.80 amt. of $200 for 3 m. 24 da.

Interest on $50 at 6% for 1 yr=$3.00
Interest on $50 at 6% for 3 m.= 1/4 of $3.00 =$ .75
Interest on $50 at 6% for 3 da.= 1/30 of $ .75 =$ .025
Interest on $50 at 6% for 3 m. 3 da. =$ .775
$50+$ .775=$50.775 amt. of $50 for 3 m. 3 da.

$ 62.28
$102.85
$203.80 $525.25 amt. of prin. for 10 m. 3 da.
$ 50.77 $419.70
$419.70 $105.55 amt. due at maturity.

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(1)—45°—30°=15°
(2)—75°—20°=55°
(3)—75°—45°=30°
(4)—90°—10°=80°
(5)—120°—5°—115°
(6)—135°—15°=120°
(7)—45°+30°=75°
(8)—30°+60°=90°
(9)—45°+45°=90°
(10)—60°+30°=90°
(11)—100°+50°=150°
(12)—90°+77°=167°
(13)—0°+57°=57°
(14)—90°—45°=45°
(15)—60°+35°=95°
(16)—96°+16°=112°
(17)—80°—35°=45°
(18)—81°+37°=118°

(19)—25° 15′
10° 30′
14° 45′
60+15′=75′—30′=45
(20)—70° 20′
15 30
54° 50′
60′+20′=80′—30′=50
(21)—90° 10′
75° 10′
15° 00′
(22)—85° 45′
15 20
70° 25′
(23)—98° 25′
45 10
53° 15′

(24)—60° 45′
10 17
50° 28′
(25)—104° 58′ 0″
71 3 50
33° 54′ 10″
(26)—122° 25′ 42″
87 36 45
34° 48′ 57″
60+42=102—45=57
24+60= 84—36=48

(27)—80° 2′ 0″
77° 3′ 6″
2° 58′ 54″
(28)—74° 0′ 24″
5 48″
73° 54′ 36″

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(1)—Pgh. 80° 2′ 00″
Bos. 71 3 50
15) 8° 28′ 10″= dif. in longitude
35 min. 52 2/5 sec. dif. in time.
(2)—St. P. 93° 4′ 55″
N. Y. 74 0 24
15) 19° 4′ 31″=dif. in longitude
1 hr. 16 min. 18 1/5 sec. dif. in time.
(3)—Pgh. 80° 2′ 00″
Port. 70 15 40
15) 9° 46′ 20″=dif. in long.
39 min. 5 1/3 sec. dif. in time.
(4)—C. 87° 36′ 45″
N. Y. 74 00 24
15) 13° 36′ 21″=dif. in longitude
54 min. 25 2/5 sec. dif. in time.
(5)—D. 104° 58′ 00″
W. 77 3 06
15) 27° 54′ 54″=dif. in long.
1 hr. 51 min. 39 3/5 sec. dif. in time.
(6)—S. 122° 25′ 42″
N. Y. 74 24
15) 48°25′ 18″=dif. in long.
3 hrs. 13 min. 41 1/5 sec. dif. in time.

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(7)—S. 122° 25′ 42″
C. 87 36 45
15) 34° 48′ 57″=dif. in long.
2 hrs. 18 min. 15 4/5 sec.=dif. in time.
(8)—N. Y. 72° 00′ 24″
Paris 2 20 14
15) 76° 20′ 14″=dif. in long.
5 hrs. 5 min. 22 8/15 sec. dif. in time.
(9)—C. 113° 16′ 30″
L. 5 48
15) 113° 21′ 78″=dif. in long.
7 hrs. 33 min. 29 1/5 sec. dif. in time.

(10)—T 139° 44′ 30″
P. 2 20 14
15) 137° 24′ 16″=dif. in long.
9 hrs. 9 min. 33 1/15 sec. dif. in time.

(11)—D. 104° 58′ 00″
B. 71 3 50
15) 33° 54′ 10″=dif. in long.
2 hrs. 15 min. 36 2/3 sec. dif. in time.

(12)—D. 104° 58′ 00″
N. Y. 74 00 24
15) 30° 57′ 36″=dif. in long.
2 hrs. 3 min. 50 2/5 sec. dif. in time.

(13)—D. 104° 58′ 00″
St. P. 93 4 55
15) 11° 53′ 5″=dif. in long.
49 min. 32 1/3 sec. dif. in time.

(14)—C. 87° 36′ 45″
B. 71 3 50
15) 16° 32′ 55″=dif. in long.
1 hr. 6 min. 11 2/3 sec. dif. in time.

(15)—Meb. 155° 58′ 35″
C. T. 18 28 40
15) 126° 29′ 55″=dif. in long.
8 hrs. 25 min. 59 2/3 sec. dif. in time.

(16)—C. 113° 16′ 30″
B. 72 45 56
15) 40° 30′ 34″= dif. in long.
2 hrs. 42 min. 2 4/15 sec. dif. in time.

(17)—T. 139° 44′ 30″
C. 113 16 30
15) 26° 28′ 00″=dif. in long.
1 hr. 45 min. 52 sec. dif. in time.

(18)—L. 5′ 48″
P. 2 20 14
15) 2° 26′ 2″=dif. in long.
9 min. 44 2/15 sec. dif. in time.

(19)—M. 120° 58′ 6″
N. Y. 74 00 24
15) 194° 58′ 30″=dif. in long.
12 hrs. 59 min. 54 sec. dif. in time.

(20)—D. 104° 58′ 00″
L. 5 48
15) 103° 52′ 12″=dif. in long.
6 hrs. 55 min. 28 4/5 sec. dif in time.

(21)—S. F. 122° 25′ 42″
P. 2 20 14
15) 124° 45′ 56″=dif. in long.
8 hrs 19 min. 3 11/15 sec. dif. in time.

(22)—M. 144° 58′ 35″
N. Y. 74 00 24
15) 218° 58′ 59″=dif. in long.
14 hrs. 35 min. 55 14/15 sec. dif. in time.

(23)—C. 87° 36′ 45″
W. 77 3 6
15) 10° 33′ 39″=dif. in long.
42 min. 14 3/5 sec. dif. in time.

(24)—D. 104° 58′ 00″
W. 77 3 06
15) 27° 54′ 54″=dif. in long.
1 hr. 51 min. 39 3/5 sec. dif. in time.
hrs. min. sec.
12
1 51 39 3/5
10 8 20 2/5=8 min. 2 2/5 sec. after 10 A. M.

(25)—Pgh. 80° 2′ 00″
W. 77 3 6
15) 2° 58′ 54″=dif. in long.
11 min. 55 3/5 sec. dif. in time before 12.

(26)—W. 77° 3′ 6″
B. 71 3 50
15) 5° 59′ 16″
23 min 57 1/15 sec. after 12.

(27)— M. 120° 58′ 6″
W. 77 3 6
15) 197° 61′ 12″=dif. in long.
13 hrs. 12 min. 4 4/5 sec. dif. in time
Time at W. 12 hrs.
1 hr. 12 min. 4 4/5 sec. before 12 o'clock.

(28)—S. F. 122° 25′ 42″.
W. 77 3 6
15) 45° 22′ 36″=dif. in long.
3 hrs. 1 min. 30 2/5 sec. dif. in time.
Time at W=12 hrs.—3hrs. 1 min. 30 2/5 sec. before 12 o'clock.
or 1 min. 30 2/5 sec. before 9 a. m.

(29)—W. 77° 3′ 6″
L. 5 48
15) 76° 57′ 18″=dif. in long.
5 hrs. 7 min. 49 1/5 sec. dif. in time after 12.

(30)— T. 139° 44′ 30″
W. 77 3 6
15) 216° 47′ 36″= dif. in long.
14 hrs. 27 min. 10 2/5 sec. dif. in time.
Time at W. 12
2 hrs. 27 min. 10 2/5 sec. before 12 o'clock, or 27 min. 10 2/5 sec. before 10 A. M.

(31)— C. 113° 16′ 30″
W. 77 3 6
15) 190° 19′ 36″=dif. in long.
12 hrs. 41 min. 18 2/5 sec. dif. in time.
Time at W. 12 hrs.
41 min. 18 2/5 sec. before 12 **midnight.**

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(1)—2 hrs.=dif. in time.
30°=dif. in long.
77° 3′ 6″=long. of W.
30°
47° 3′ 6″=long. of other city.

(2)—3 hrs.=dif. in time.
45°=dif. in long.
77° 3′ 6″=long of W.
45°
32° 3′ 6″=long. of other city.

(3)—4 hrs. 30 min.=dif. in time.
15×4 hrs. 30 min.=67° 30′ dif. in long.
77° 3′ 6″—67° 30′=9° 33′ 6″ dif. of other city.

(4)—hrs. min.
6 45
15
101° 15′=dif. in long.
77 3′ 6″=long. of W.
24° 11′ 54″=long. of other city.

(5)—hrs. min.
8 30
15
137° 30′ =dif. in long
77 3′ 6″=long. of W.
50° 26′ 54″=long. of other city.

(6)— 11 hrs.=dif. in time.
165°=dif. in long.
77° 3′ 6″=long. of Washington.
87° 56′54″=long. of other city.

(7)— 12 hrs.—10 hrs.=2 hrs.=dif. in time.
30°=dif. in long.
77° 3′ 6″=long. of W.
107° 5′ 6″=long. of other city.

(8)—hrs. min.
12
9 15
2 45=dif. in time.
15
41° 15=dif. in long.
77 3′ 6″=long. of W.
118° 18′ 6″=long. of other city.

(9)—hrs. min.
12
7 30
4 30′=dif. in time.
15
67° 30′=dif. in long.
77° 3′ 6″=dif. of W.
144° 33′ 6″=long. of other city.

(10)—hrs.	min.
12	
5	50
6	10=dif. in time.
	15
92°	30′=dif. in long.
77	3′ 6″=long. of W.
169°	33′ 6″=long. of other city.

(11)—hrs.	min.	sec.
12		
6	20	
5	40=dif. in time.	
	15	
85°	=dif. in long.	
77	3′ 6″	
162	3′ 6″	

(12)—12 hrs.—4 hrs.=8 hrs.=dif. in time.
15×8—120°=dif. in long.
120°—77°3′6″=62°56′54″

(13)—hrs.	min.	sec.
3	15	15
		15
48°	48′	45″
77°	3′	6
48	48	45
28	14	21

(14)—hrs.	min.	sec.
1	20	45=dif. in time.
		15
20°	11′	15″=dif. in long.
77°	3	6 =long. of W.
20	11	15
56°	51′	51″=long. of other city

(15)—hrs.	min.	sec.
10	15	45 =dif. in time.
		15
153°	56′	15″=dif. in long.
77	3	6 =long. of W.
76°	53′	9″=long. of other city.

(16)—hrs.	min.	sec.
12		
9	10	30
2	49	30 =dif. in time.
		15
42°	21′	30″=dif. in long.
77	3	6 =long. of W.
119°	25′	36″=long. of other city.

(17)—hrs.	min.	sec.
11	15	30 =dif. in time.
		15
168°	52′	30″=dif. in long.
77	3	6 =long. of W.
91°	49′	24″=long. of other city.

(18)—hrs. min. sec.
12 20 30 =dif. in time.
15
E. 185 7 30 =dif. in long.
W. 77 3 6 =long. of W.
262 10 36 --W.
360°
262 10 36 W.
97° 49′ 24″ E.

(19)—Paris — 2° 20′ 14″ E.
N. Y.—74 00 24″ W.
15: 76° 20′ 38″=dif. in long.
5 hrs. 5 min. 22 8/15 sec.=dif. in time.
3 P. M.=time at Paris, therefore it is 5 min. 22 8/15 sec. be-
(fore 10 A. M. at N. Y.

(20)—11—4=5 hrs. 45 min. 49 2/15 sec.=dif. in time.
86° 7′ 17″=dif. in long.
74 00 24 =long. of N. Y.
12° 6′ 53″=long. of Rome.

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(1)—5 km×1000=5,000m.
(2)—3.5 km.×1000=3,500 m.
(3)—15 km.×1000=15,000 m.
(4)—21.7 km.×1000=21,700 m.
(5)—15.08 km.×1000=15,080 m.
(6)—6 hm.×100=600 m.
(7)—45 dm.×10=450 m.
(8)—1.8 hm.×100=180 m.
(9)—12.3 dm.×10=123 m.
(10)—11.15 dm.×10=111.5 m.
(11)—125 dm.÷10=12.5 m.
(12)—12.5 dm.÷10=1.25 m.
(13)—1.25 dm.÷10=.125 m.
(14)—175 cm.÷100=1.75 m.
(15)—1450 cm. ÷100=14.5 m.
(16)—2400 cm.÷100=2.4 m.
(17)—354.6 mm.÷1000=.3546 m.
(18)—11.75 cm.÷100=.1175 m.
(19)—11.75 dm.÷10=1.175 m.
(20)—1405 cm.÷100=14.05 m.
(21)—3 km.×1000=3000 m.
5 hm.× 100= 500 m.
3500 m

(22)—5 hm×100=500 m.
8 dm.× 10= 80 m.
580 m.

(23)—4 km.×1000=4000 m.
4 dm.× 10= 40 m.
4040 m.

(24)—4 m. =4 m.
5 dm.÷10 = .5 m.
4.5 m.

(25)—15 m. =15 m.
8 dm.÷10 = .8 m.
15.8 m.

(26)—35 m. =35 m.
25 cm.÷100 = .25 m.
35.25 m.

(27)—45 dm.÷10 =4.5 m.
45 cm.÷100 = .45 m.
4.95 m.

(28)—15 dm.÷10 =1.5 m.
57 cm.÷100 = .57 m.
2.07 m.

(29)—25 cm.÷100 = .25 m.
75 dm.÷10 =7.5 m.
7.75 m.

(30)—10 ft.×.3048=3.048 m.
(31)—32 ft.×.3048=9.7536 m.
(32)—5.6 ft.×.3048=1.70688 m.
(33)—35.5 in.÷39.37=.901 m.
(34)—110 in.÷39.37=2.794 m.
(35)—2 ft. 5.5 in.=29.5 in.
29.5 in.÷39.37=.749 m.
(36)—12 m.×$\frac{39.37}{12}$=39.37 ft.
(37)—15.75 m.×$\frac{39.37}{12}$=51.67 ft.

(38)—4.875 dm.×10×$\frac{39.37}{12}$=159.94 ft.

(39)—$\frac{2500}{10}$ cm.×$\frac{39.37}{12}$=82.02 ft

(40)—$\frac{2500}{10}$ dm.×$\frac{39.37}{12}$=820.2 ft

(41)—$\frac{11250 \text{ mm.}}{1000}\times\frac{39.37}{12}=36.9$ ft.
(42)—4 km.÷1.609=2.48 mi.
(43)—12.5 Km.÷1.609=7.76 mi.
(44)—10.5 Km.÷1.609=6:52 mi.
(45)—125.5 Km.÷1.609=77.93 mi.
(46)—100 mi×1.609=180.09 Km.
(47)—125 mi.×1.609=201.125 Km.
(48)—.024 mi.×1.609=.040215 Km.
(49)—.00125 mi.×1.609=.00201 Km

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(1)—125 sq. Km.×100×100×100=125,000,000 sq. m.
(2)—160 sq. km.×100×100=1,600,000 sq. mi.
(3)—250 sq. Dm.×100=25,000 sq. m.
(4)—124.5 sq. Km.×100×100×100=1,245,000,000 sq. m.
(5)—375.25 sq. Hm.×100×100=3,752,500 sq. m.
(6)—1250.05 sq. Dm.×100=125,005 sq. m.
(7)—15625 sq. mm.÷(100×100×100)=.015625 sq. m. (Book wrong).
(8)—25400 sq. Cm.÷(100×100)=2.54. sq. m.
(9)—154500 sq. Dm.÷100=1.545 sq. m.
(10)—100 sq. M×1,196=110.6 sq. yds.
(11)—11.5 sq. M.×1.196=13.754 sq. yds.
(12)—1.125 sq. M.×1.196=1.3455 sq. yds.
(13)—.125 sq. Km.×100×100×100=149,500 sq. yds.
(14)—12.5 sq. Km.×.386=4.825 sq. mi. (Book wront).
(15)—24.1 sq. Km.×.386=9.3026 sq. mi. (Book wrong).
(16)—.0125 sq. Km.×.386=.004825 sq. mi. (Book wrong).
(17)—(11375 sq. M.÷100×100)×.386=.439075 sq. mi. (Book wrong)

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(1)—1500 cu. cm.÷1000=1.5 cu. dm.
150000 cu. cm.÷1000=150 cu. dm.
(2)—35000 cu. mm.÷1000=35 cu. cm.
125000 cu. mm.÷1000=125 cu. cm.
(3)—4570000 cu. mm.÷100=4570 cu. mm.
12,575,000 cu. mm.÷(1000×1000)=12.575 cu. dm.
(4)—15 cu. m.×1000=15000 cu. dm.
150 cu. dm.×1000=150000 cu. c.
(5)—257 cu. m.×1000=275000 cu. dm.
4500 cu. dm.×1000=4500000 cu. cm.
(6)—15750 cu. dm.×1000=15750000 cu. mm.

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(1)—15÷10=1.5 Dl.
(2)—12.5÷10=1.25 Dl.
(3)—500÷100=5l or 500÷10=50 dl.
(4)—3500÷10=350 cl. or 3500÷100=35 dl. or 3500÷1000=3.5 l.
(5)—254.75÷10=25.475. l. or 254.75÷100=2.5475 dl. -
(6)—254.75÷10=25.475 H. L. or 254.75÷100=2.5475 K. L.
(7)—35×10=350 Hl.
(8)—45.8×10=458 Dl.
(9)—175.25×10=1752.5 l.
(10)—147.5×10=1475 dl.
(11)—35.125×10=351.25 dl.
(12)—45.25×10=452.5 ml.
(13)—10×1.0567=10.567 qts.
(14)—12.5×1.0567=12.2087 qts.
15.—175.2×1.0567=185.1338 qts.
(16)—15÷10=1.5×1.0567=1.585 qts.
(17)—1.4×100×1.0567=147.938 qts. (Book wrong).
(18)—25.8×1000×1.0567=27,262.86 qts.
(19)—35×.908=31.78 qts.

(20)—15.8×.908=14.3464 qts.
(21)—250.75÷10=25.075×.908=22.7681 qts.
(22)—175÷10=17.5×.908=15.89 qts.
(23)—25.125×10=251.25×.908=228.135 qts.
(24)—15,000÷100=150×.908=136.2 qts.
(25)—5.5×2.8375=15.606 bu.
(26)—12.1×2.8375=34.333 bu. (Book wrong).
(27)—175÷100×1.75×2.8375=4.9656 bu.
(28)—25,000÷1000=25×2.8375=70.9375 bu.
(29)—15.÷2.8375=5.286 Hl.
(30)—75.5÷2.8375=26.607 Hl.
(31)—320÷4=80÷2.8375=28.193 Hl.
(32)—1600÷32=50÷2.8375=17.621 Hl.

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(1)—12×1000=12,000 g.
(2)—15.5×1000=15,500 g.
(3)—1.75×1000=1.750 g.
(4)—75.8×100=7580 g.
(5)—157.1×10=1571 g.
(6)—154.25×1,000=154,250 g.
(7)—1500÷1000=1.5 g.
(8)—1750÷100=17.5 g.
(9)—3750÷10=375 g.
(10)—17500÷1000=17.5 g.
(11)—187500÷1000=187.5 g.
(12)—187500÷100=18.75 g.
(13)—15×2.20462=33.0693 lbs.
(14)—1.25×2.20642=2.75577 lbs.
(15)—12.5×2.20462=27.5577 lbs.
(16)—12.5×.0220462=.2755 lbs.
(17)—157.1×.220462=34.6345 lbs.
(18)—157100÷1000=157.1=2.20462=346.3458 lbs.
(19)—35.125×.0220462=.7743 lbs.
(20)—120,000÷100,000=1.2×2.20462=2.6455 lbs.

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* In probles 1, 2, 3, 13 and 14 Kg. should read L; 4, 5, 6, 7, and 8 g. should read cc. according to answers.

(1)—100×7.8=780.*
(2)—120×19.3=2316*
(3)—15.125×8.8=133.1*
(4)—100,000×11.3=1,130,000*
(5)—25,000×21.1=527,500*
(6)—10,000×8.8=88,000*
(7)—156,500×11.3=1,768,450*
(8)—345,000×19.3=6,658,500*
(9)—5000×.70=3500
(10)—150,000×1,000×.75=112,500,000*
(11)—2500×1000×.79=1,975,000*
(12)—10,000×10×.92=92,000
(13)—150,000×.92=138,000
(14)—200,000×.79=158,000
(15)—15,000×1000×.70=10,500,000*
(16)—35,000×.75=26,250.

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1. 1m. =39.37 in.
$1\text{mm.}=\frac{39.37}{1000}=.03937$ in.
7mm.=7×.03937=.27559 in.

2. 1 mi.=1.60935 Km.
40.5 mi.=40.5×1.60935Km.=65.178675Km.

3. 5.14Km. =5140m.
275m. = 275m.
31.25Hm.=3125m.
5140m.+275m.+3125m.=8540.=8.54Km.

4. 100 l.@$.75 per l.=$75.00 total cost
1 l.=1.0567 qt.
100 l.=105.67 qt.
105.67×$ .90=$95.1030
$95.10—$75.00=$20.10 gain.

5. 24×15=360, the number of sq. meters
1 sq. m.=1.196 sq. yd.=10.764 sq. ft.
360 sq. m.=360×10.764 sq. ft.=3875.04 sq. ft.

6. 1 T.=.90718 M.T.
5000 T.=5000×.90718 M.T.=4535.9 M.T.

7. Vol. of the pyramid= $\cfrac{\cfrac{\cfrac{764^2}{480}}{3}}{27}$ cu. yds.=3456724 cu. yds.
1 cu. yd.=.765 cu. m.
3456724 cu. yds.=3456724×.765 cu. m.=2646394.86 cu. m.

8. 1 l.=2.1134 pt.
2000 l.=2000×2.1134 pt.=4226.8 pt.
4227 bottles will be required

9. 1 ft.=.3048m.
100 ft.=100×.3048=30.48 m.
1000m. =1 Km.
30.48m.=.03048 Km.

10. 1 lb.=.45359 Kg.
800×196 lb.=800×196×.45359 Kg.=71,122,912 **Kg.**

11. Area of lot=1800 sq. m.=18 centares=.18 Ha.
1 Ha.=2.471 A.
.18 Ha.=.18×2.471 A=.4447 A.
1 A. costs $1200.
.4447 A. costs .4447×$1200.=$533.64

12. 1 gal.=3.78544 l.
15 gal.=15×3.78544 l.=56.7916 l.

13. 1 Km.=1000×39.37 in.=39370 in.
39370÷30=1312 1/3, the number of steps.

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14. 1 Kg.=100,000 cg.
1.2 Kg.=120,000 cg.
120,000÷12=10,000, the number of capsules.

15. 1 mi.=1.6 Km. (approx.)
3305.164 mi.=3305.164×1.6 Km.=5288.2624 Km.=5288262.4 **m.**

6. 1 l. water (sp. g., 1) weighs 1 Kg.
1 l. oil (sp. g., .915) weighs .915 Kg.
32.5 l. oil weigh 32.5×.915 Kg.=31.7375 Kg.

7. (Data not sufficient to allow of solutionof problem. **Omit.)**

18. 1 gal.=3.78544 l.
240 gal.=240×3.78544 l.=908.5+ l.
1 l. weighs 2 Kg.
908.5 l. weigh 908.5×2 Kg.=1817+ Kg.
19. 1 Km.=.62137 mi.
326 Km.=326×.62137 mi.=202.566+ mi.
1 mi. costs 19.3 centimes
202.566 mi. cost 202.566×19.3 centimes=3909.5238 centimes
20. 1 Km.=.62137 mi.
75 Km.=75×.62137 mi.=46.6+ mi.
75 mi.—46.6 mi.=28.4— mi.
21. 1 m.= 39.37 in.
10.125 m.=10.125×39.37 in.=398.62125 in.=33 ft., 2.62 in.
22. 2×56 Cm.=112 Cm.
2×35.5 Cm.=71 Cm.
16 in. (loss at corners)=40.64 Cm.
Total length of molding=223.64 Cm.
1 ft.=.3046 M=30.46 Cm.
223.64÷30.46=7.34 ft.
23. 142 Kg.—15.75 Kg.=126.25 Kg., wt. of water.
1 Kg.=1 l.
126.25 Kg.=126.25 l.=33.352 gal.

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24. 28 in.+7 in.=35 in., total diameter.
35×3 1/7=110 inches in circumference.
110 in.=9 1/6 ft.
1 ft.=.3046 m.
9 1/6 ft.=9 1/6×.3046 m.=2.7923.
1000 m.÷2.7923=358+, turns.
25. Vol. of bar.=.0668 cu. ft.
60% of .0668 cu. ft.=.04 cu. ft.
1 cu. ft.=28,259.68 cu. cm.
.04 cu. ft.=.04×28,259.68 cu. cm.=1130.38+ cu. cm. copper
1 cu. cm. water weight 1 g.
1 cu. cm. copper (sp. g. 8.8)=8.8 g.
1130.38×8.8 g.=9947.344 g. of copper. Ans.
40% of .0668 cu. ft.=.0267 cu. ft.
.0267×28,259.68 cu. cm.=754.43 cu. cm. zinc.
1 cu. cm. zinc (sp. g. 7.15)=7.15 g.
754.43 cu. cm.=754.43×7.15 g.=5394.1745 g. of zinc.
26. (Data not sufficient to allow of solution. Omit.)
27. 145 Kg.—20 Kg. (wt. of cask)=125 Kg. (wt. of oil).
1 l. weighs .91 Kg.
125÷.91=137.3 l.
28. Capacity of room=7920 cu. ft.=293.7 cu. yd.
1 cu. yd.=.765 cu. m.
293.7 cu. yd=293.7×.765 cu. m.=224.6805 cu. m.=224680.5 l
1 l. weighs 1.292 g.
224680.5 l. weigh 224 680.5×1.292 g.=290,287.206 g.=290.287
1 Kg.=2.2 lbs.
290.287 Kg.=290.287×2.2 lbs.=638.62 lbs.
29. 1 gal.=3.785 l.
1/16 gal.=.236 l. to run 1 mi. or 1.59934 Km.
1.59934÷236=6.8 Km.

30. Original cost of silk per meter=\$2.80
45% of \$2.80=\$1.26 the duty
Shipping freight, insurance, etc., cost \$.60
\$2.80+\$1.26+\$.60=\$4.66, total cost per meter
30% of \$4.66=\$1.40, gain
\$4.66+\$1.40=\$6.06, price for which 1 m. must sell
1 m.=1.09 yd.
6.06÷1.09=5.56, the number of dollars for which 1 yd. must **sell.**

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(1)—

		3375	15
10^3	=	1000	
		2375	
3×10^2	=300		
$3\times10\times5$	=150		
5^2	= 25		
	475		
5×475	=	2375	

(2)—

		9261	21
20^3	=	8000	
		1261	
3×20^2	=1200		
$3\times20\times1$	= 60		
1^2	= 1		
	1261		
1×1261	=	1261	

(3)—

		29791	31
30^3	=	27000	
		2791	
3×30^2	=2700		
$3\times30\times1$	= 90		
1^2	= 1		
	2791		
1×2791	=	2791	

(4)—

		54872	38
30^3	=	27000	
		27872	
3×30^2	=2700		
$3\times30\times8$	= 720		
8^2	= 64		
	3484		
8×3484	=	27872	

(5)— 46656 | 36
30^3 = 27000
19656
3×30^2 = 2700
$3\times30\times6$ = 540
6^2 = 36
3276
6×3276 = 10656

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(6)— 68921 | 41
40^3 = 64000
4921
3×40^2 = 4800
$3\times40\times1$ = 120
1^2 = 1
4921
1×4921 = 4921

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(7)— 79507 | 43
40^3 = 64000
15507
3×40^2 = 4800
$3\times40\times3$ = 360
3^2 = 9
5169
3×5169 = 15507

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(8)— 85184 | 44
40^3 = 64000
21184
3×40^2 = 4800
$3\times40\times4$ = 480
4^2 = 16
5296
4×5296 = 21184

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(9)— 157464 | 54
50^3 = 125000
32464
3×50^2 = 7500
$3\times50\times4$ = 600
4^2 = 16
8116
4×8116 = 32464

(10)—		314432	68
60^3	=	216000	
		98432	
3×60^2	=10800		
$3\times60\times8$	= 1440		
8^2	= 64		
	12304		
8×12304	=	98432	

(11)—		658503	87
80^3	=	512000	
		146503	
3×80^2	=19200		
$3\times80\times7$	= 1680		
7^2	= 49		
	20929		
7×20929	=	146503	

(12)—		941192	98
90^3	=	729000	
		212192	
3×90^2	=24300		
$3\times90\times8$	= 2160		
8^2	= 64		
	26524		
8×26524	=	212192	

(13)—		8242408	202
200^3	=	8000000	
		242408	
3×200^2	=120000		
$3\times200\times2$	= 1200		
2^2	= 4		
	121204		
2×121204	=	242408	

(14)—		7880599	199
10^3	=	1000	
		6880	
3×10^2	=300		
$3\times10\times9$	=270		
9^2	= 81		
	651		
9×651	=	5859	
		1021599	
3×190^2	=108300		
$3\times190\times9$	= 5130		
9^2	= 81		
	113511		
9×113511	=	1021599	

(15)— 2248.091 | 13.1

$10^3 = 1000$

1248

$3\times10^2 = 300$
$3\times10\times3 = 90$
$3^2 = 9$

$= 399$

$3\times399 = 1197$

51091

$3\times130^2 = 50700$
$3\times130\times1 = 390$
$1^2 = 1$

51091

$1\times51091 = 51091$

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(16)— 7.529536 | 1.96

$10^3 = 1000$

6529

$3\times10^2 = 300$
$3\times10\times9 = 270$
$9^2 = 81$

651

$9\times651 = 5859$

670536

$3\times190^2 = 108300$
$3\times190\times6 = 3420$
$6^2 = 36$

111756

$6\times111756 = 670536$

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(17)— .004713 | .17

$10^3 = 1000$

3913

$3\times10^2 = 300$
$3\times10\times7 = 210$
$7^2 = 49$

559

$7\times559 = 3913$

(18)—		141.420761	5.21
50^3	=	125000	
		16420	
3×50^2	$=7500$		
$3\times520\times1$	$=300$		
2^2	$=4$		
	7804		
2×7804	=	15608	
		812761	
3×520^2	$=811200$		
$3\times520\times1$	$=1560$		
1^2	$=1$		
	812761		
1×812761	=	812761	

(19)—		.065939264	.404
40^3	=	64000	
		1939264	
3×400^2	$=480000$		
$3\times400\times4$	$=4800$		
4^2	$=16$		
	484816		
4×484816	=	1939264	

(20)—		124251.499	49.9
40^3	=	64000	
		60251	
3×40^2	$=4800$		
$3\times40\times9$	$=1080$		
9^2	$=81$		
	5961		
9×5961	=	53649	
3×490^2	$=720300$	6602499	
$3\times490\times9$	$=13230$		
9^2	$=81$		
	733611		
9×733611	=	6602499	